3. On the Anatomy, Classification, and Distribution of the Arctoidea. By St. George Mivart.

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In 1882 I had the honour of laying before this Society some notes on the Classification and Distribution[1], as also on the Anatomy,[2] of the Æluroidea.

The homogeneous group of the Cynoidea has been pretty exhaustively treated of in successive papers in the 'Proceedings' of this Society by Mr. Waterhouse[3], Mr. Turner[4], Professor Flower[5], and Professor Huxley[6].

It remains to offer some supplementary remarks upon the remaining and third Suborder of Fissiped Carnivora, that is the Arctoidea. It was my intention that my notes on this suborder should have followed quickly upon my papers above referred to, but the carrying out of that intention was unavoidably delayed by illness.

The animals comprised under the designation Arctoidea were not regarded by Mr. Waterhouse as forming a single group in that paper of his, on the Crania of the Carnivora, which formed the starting-point of the subsequent papers on the classification of the Carnivora in the 'Proceedings' of the Zoological Society. In that paper[7] he divides the Carnivora into the six families *Canidæ, Viverridæ, Felidæ, Mustelidæ, Ursidæ,* and *Phocidæ,* and about the fourth and fifth of these (which make up the Arctoidea) he makes the following remarks:—

"The *Mustelidæ,* like the *Felidæ,* have the muzzle short and obtuse; the skull, however, is more elongated. They may be distinguished by there being one true molar on either side of each jaw; that in the upper jaw is well developed and generally transverse, but in some, such as the Badger, it is longer than broad; in the Otters, Skunks, and American Badger (*Taxidea labradorica*), the true molar is intermediate in form between that of the Common Badger (*Meles vulgaris*) and the typical *Mustelidæ.* The false molars in the Weasels (*Mustela*) are typically $\frac{3-3}{4-4}$, but in some species they are reduced to $\frac{1-1}{3-3}$. As in the *Felidæ,* the angle of the lower jaw, in the greater portion of the *Mustelidæ,* is on the same plane as the lower edge of the horizontal ramus; it other Carnivora it is raised. In this family there is a tendency in the glenoid cavity of the temporal bone to enclose the condyle of the lower jaw. The condyle is more truly cylindrical, and longer than in other Carnivora. In the Dogs there is no trace of the anterior descending process of the temporal bone, which in the Mustelas confines the condyle of the lower jaw; in other Carnivora there is always a slight trace of the process, but in none does it enclose the condyles, as in most of the *Mustelidæ.*

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[1] See P. Z. S. 1882, p. 135.

[2] *L. c.* p. 459.

[3] P. Z. S. 1839, pp. 135–137.

[4] *L. c.* 1848, pp. 82–87.

[5] P. Z. S. 1869, pp. 23–26, and also 35 & 37; figs. 11 & 12, p. 25.

[6] "On the Cranial and Dental Characters of the Canidæ," P. Z. S. 1880 pp. 238–288. A very elaborate paper, illustrated by sixteen woodcuts.

[7] P. Z. S. 1839, p. 135.

"The genera contained in this family are *Mustela, Zorilla, Galictis,* Bell (which must not be confounded with the *Galictis* of Is. Geoffroy St. Hilaire, published in the 'Comptes Rendus' for October 1837, p. 581), *Mellivora, Ursitaxus, Helictis,* and *Gulo,* in which the true molar of the upper jaw is transverse; *Lutra* and *Mephitis,* in which the tooth approaches more or less to a square form; *Taxidea,* in which it is triangular; and, lastly, *Meles, Arctonyx,* and *Mydaus,* in which the true molar is longer than broad.

"In the *Ursidæ* there are two well-developed true molars on either side of each jaw; the 'carnassière'[1] here has changed its functions, not being suited, as in other Carnivora, to cutting flesh. The palate is considerably elongated. In the Bears (*Ursus* and its subgenera) it is small, being robbed as it were of its nutriment by the true molars, which are very large. In the other *Ursidæ* (*Procyon, Nasua, Cercoleptes, Arctictis*[2], and *Ailurus*), the 'carnassière,' especially that of the upper jaw, and the true molars are nearly equal in size, and also nearly resemble each other in other respects.[3]

"In the true Bears the form of the lower jaw differs from that of any of the preceding Carnivora in having a projecting process on the underside of the ramus, and situated a little in advance of the angle of the jaw. The same character is also found in many Seals, which in several other respects appear to approach the Bears."[4]

Mr. Waterhouse's two families *Mustelidæ* and *Ursidæ* were united by the late Mr. H. N. Turner[5] into the single family *Ursidæ,* which was equivalent to the group here designated Arctoidea, and which he divided into the four subordinate groups (1) *Ursina,* (2) *Ailurina,* (3) *Procyonina,* and (4) *Mustelina.* As to these groups, Mr. Turner has expressed the following views, and made the following observations:—

"In the Ursina we find no trace of a pterygoid fossa, the outer pterygoid process being closely pressed against the inner one, or true pterygoid bone, and sending off a strong lamina of bone to enclose the alisphenoid canal, and, almost from its apex, a strong column of bone which runs backwards, extending behind the foramen ovale, which it quite converts into a canal. The auditory bulla, although, from the flat surface which it presents, it scarcely merits the name, yet may be perceived to show the same essential character as in the Weasels, which is, that it rises suddenly on the inner side at once to its greatest prominence, and is then flattened off towards the meatus, which is rather prolonged. The course of the internal carotid artery, as indicated by the canal excavated for it in the bone, is as follows: It enters by a true canalis caroticus excavated in the bone of the ear, commencing quite behind, in the same fissure in which open the foramen jugulare and the aperture, through which the nervous vagus issues from the skull, and, extending forwards in a slightly arched direction, again emerges anteriorly, and, curving round, enters the cranium in a backward direction, through a round foramen between the sphenoid bone and that of the ear, close to the aperture from which the Eustachian tube would issue, and corresponding to the foramen lacerum anterius; there is a distinct foramen glenoideum, although opening rather more inwardly than usual; the mastoid and paroccipital processes are both largely developed, and, owing to the very slight projection of the auditory bulla, stand out very distinct and prominent; the foramen condyloideum anterius occupies an exposed situation; the foramen condyloideum posterius I have never seen in any skull but the human, and here it is said to be sometimes wanting. The characters presented by the lower jaw in the Bears are essentially those most usual, though not quite constant, among the Weasel group; the angular process is pushed up very near to the condyle, and much flattened beneath; the form of the coronoid process is somewhat that of the true Weasels, but owing to the jaws being in the Bear more pushed forwards, relatively to the situation of the cranial cavity, than in the Weasels, this process is more pushed backwards to meet the temporal muscle. With regard to the little process projecting beneath and anterior to the angle of the jaw, it is a mere superaddition, which appears again in *Cercoleptes*, as also in *Otocyon* and *Nyctereutes*, when it has the form of a large vertical lamella, projecting from the lower surface of the jaw; it is also seen like a second angular process in the Seal, so that I should not feel inclined to assign to it more than a generic value.

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[1] The "carnassière" is the sectorial tooth, *i. e.* the fourth upper premolar, against which the lower sectorial, or first lower true molar, bites.

[2] That *Arctictis* is not an Arctoid but an Æluroid is now universally known and admitted, though De Blainville figures it amongst the members of his genus "*Subursus.*"

[3] Mr. Waterhouse adds in a note:—"From an examination of the external characters of *Bassaris astuta,* it appears to me that it belongs to this group," *i. e.* to the *Ursidæ.*

[4] I have thought it worth while to reprint this extract, as being of so old a date as to have a certain historical interest, and because many Fellows of the Society may not possess the 'Proceedings' of so many years ago.

[5] P. Z. S. 1848, pp. 75–86.

"In the Mustelina the pterygoid appendages very seldom manifest any tendency to form a fossa, although in many species the outer surface is rough and marked with ridges for muscular attachment; from behind is continued most usually a ridge which runs backwards and outwards along the lower and posterior margin of the foramen ovale. This group is constantly marked by the entire absence of the alisphenoid canal. In the remaining characters this group presents no essential difference from the Bears; the commencement of the canalis caroticus is usually near the middle of the inner side of the auditory bullæ, and anteriorly the vessel does not again quite reach the outside of the cranium, simply showing itself at the point where it doubles, through the cartilage covering the foramen lacerum anterius.

"The modifications of the bulla mostly depend on the size of the species, it being much more swollen in the smaller ones; the mastoid and paroccipital processes are also developed in relation to the dimensions of the species, or even the age of the individual; in the smallest species they have hardly any projection, while in the larger ones they show the same essential structure as in the Bears.

"Among the characters which I have pointed out in the base of the cranium, it will be seen that the only tangible distinction between the Bears and the Weasels is the presence of the alisphenoid canal in the former, and its constant absence in the latter. Much as I have insisted upon the importance of this character as assisting to distinguish groups, I do not consider it sufficient alone to entitle the groups which it separates to the rank of *families*; neither am I prepared to admit the difference of the teeth sufficient for that purpose, these being mere adaptive modifications. In the true Bears the number of true molars is on each side *two* above and *three* below. In the Weasels it is only *one* above and *two* below. In the Subursine group, to which I must add *Bassaris*, it is *two* above and *two* below; and among these it is only *Ailurus* which possesses the alisphenoid canal."

He further expressed his views in a synopsis as follows:—

"Fam. URSIDÆ.

"Auditory bulla rising suddenly on its inner side, and more or less flattened off towards the meatus.

"Paroccipital process prominent, and neither flattened on the surface of the auditory bulla, nor laterally compressed.

"Foramen condyloideum exposed. A considerable foramen glenoideum.

"*No* cæcum. *No* Cowper's glands.

"Prostate gland not salient, being contained in the thickened walls of the urethra.

"Subfamily URSINA (of general geographical distribution).

"A distinct alisphenoid canal.

"Internal carotid artery reappearing externally, after passing through its canal, and doubling back to enter the cranium.

"True molars on each side $\frac{2}{3}$.

"*Ursus* (including the subgenera).

"Subfamily AILURINA (confined to India).

"A distinct alisphenoid canal.

"True molars on each side $\frac{2}{2}$.

"*Ailurus.*

"Subfamily PROCYONINA (confined to America).

"No alisphenoid canal.

"True molars on each side $\frac{2}{2}$.

Procyon.
Nasua.
Cercoleptes.
Bassaris.

"Subfamily MUSTELINA (of general geographical distribution).

"No alisphenoid canal.

"True molars on each side $\frac{1}{2}$.

Arctonyx.
Meles.
Taxidea.
Mydaus.
Mephitis.
Gulo.
Helictis.
Mellivora.
Grisonia.
Galera.
Vison.
Mustela.
Martes.
———
Lutra."

The distinctions and observations of Mr. Turner have been further developed and perfected by Professor Flower in his elaborate paper on the Classification of the Carnivora[1], wherein the principal cranial characters of nearly all the Arctoid genera are described, with figures of the skulls of *Ursus, Putorius, Procyon,* and *Bassaris* (figs. 1, 2, 3, 3*a*, and 4), and their points of agreement are summed up as follows[2]:—"They all agree in having the intestinal canal without a cæcum, all other known Carnivora[3] possessing this appendage. Moreover they all agree together, and differ from all other Carnivora, in the structure of the generative organs of the male, facts of considerable value in determining affinities. They all have a large penis, with a very considerable bone, which is usually more or less curved, somewhat compressed, not grooved, dilated posteriorly, and often bifurcated, or rather bilobed, in front. They are all destitute of Cowper's glands. All have the prostate rudimentary, or consisting only of a thickening of the wall of the urethra and forming no distinct prominence.

"Among all the diversity in the characters of the base of the cranium, especially in the form of the auditory bulla, the following points of general agreement are to be found:—

"(1) The cavity of the bulla is simple (compared with *Felis*). That is, although there are frequently trabeculæ or partial septa passing mostly transversely across the lower part, and generally connected with the tympanic ring, there is no distinct and definite septum dividing it into a separate outer and inner chamber. In all cases, on looking into the external auditory meatus (in the dried skull when the membrana tympani is removed) the opposite wall of the bulla can be seen, or if a probe is passed into the meatus, no obstacle will prevent its touching the inner wall. Whatever the diversity of development of the bulla, it always has its greatest prominence near the middle of the inner border, and slopes away from that point, not only externally, but also forwards and backwards.

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[1] P. Z. S. 1869, p. 4.

[2] *L. c.* p. 14.

[3] Subsequently Prof. Flower discovered that the cæcum is absent in *Nandinia*. It may also be entirely absent in *Arctictis*.

"(2) The inferior lip of the external auditory meatus is always considerably prolonged.

"(3) The paroccipital process is more or less triangular, and directed backwards, outwards, and downwards, standing quite aloof from the bulla. This relation depends chiefly on the want of development of the posterior portion of the bulla, and is absent or obscure in *Mustela* alone.

"(4) The mastoid process is widely separated from the paroccipital, and generally very prominent.

"(5) The carotid foramen is always large, and placed usually near the middle, but sometimes more posteriorly, on the inner margin of the bulla. It is generally very conspicuous, but sometimes partially concealed by the projecting lip of the basioccipital.

"(6) The condyloid foramen is distinct and exposed, and although sometimes partially overlapped posteriorly by a ridge of bone passing from the paroccipital to the condyle, it is never sunk into a common opening with the foramen lacerum posticum.

"(7) The glenoid foramen is always present, and generally very conspicuous. In *Enhydris* it is least so.

"(8) The alisphenoid canal is present in the true Bears and *Ailurus*, absent in all the others. Hence it cannot be used to characterize the entire group, though useful in aiding its subdivision.

"The group thus defined is, I think, too extensive, and presents too great variation among its members, in dentition and external characters, to constitute a family, as proposed by Mr. Turner. I would rather regard it as a primary section of the fissipedal Carnivora, to which the name of ARCTOIDEA might be given.

"I perfectly agree with Mr. Turner that it is further divisible into four chief sections, or families as I should call them—the *Ursidæ*, *Ailuridæ*, *Procyonidæ*, and the *Mustelidæ*.

"Of the Arctoidea, the true Bears are the most specialized or aberrant; they form a very compact group, distinguished by their very characteristic dentition, and their completely plantigrade mode of progression. They have a very wide geographical range. On the other hand the *Procyonidæ*, though few in numbers and restricted to the warmer and temperate parts of the American continent, are structurally less closely connected, at least if the singular *Cercoleptes* is truly a member of this group. Except for the increased number of the molar teeth, which is the only definite character by which they can be separated from the *Mustelidæ*, I see no reason for considering the *Procyonidæ* more nearly allied to the *Ursidæ* than are the other families of the group, or for speaking of them as specially 'subursine.'

"*Ailurus* (an unfortunate name for an animal so essentially Arctoid) appears to me to be an isolated form. Its dentition, though remarkably modified in character, is numerically that of the *Procyonidæ*; but certain cranial peculiarities and its Asiatic habitat lead me to concur with Mr. Turner in placing it in a distinct group.

"The *Mustelidæ* constitute a large, widely diffused, and somewhat disjointed group, but exceedingly difficult to reduce into natural subfamilies. The most aberrant or specialized are the Otters, which, ending with *Enhydris*, run parallel to the Bears towards the Pinnipedia."

In his article "Mammalia" in the 'Encyclopædia Britannica,' Professor Flower arranges the Arctoidea as follows:—

ARCTOIDEA.

Family MUSTELIDÆ.	
I. Subfamily LUTRINÆ....	*Lutra, Aonyx, Enhydra.*
II. Subfamily MELINÆ	*Mephitis, Arctonyx, Mydaus, Meles, Taxidea, Mellivora, Helictis, Ictonyx.*
III. Subfamily MUSTELINÆ..	*Galictis, Mustela, Putorius, Gulo.*
Family PROCYONIDÆ.	*Procyon, Bassaris, Bassaricyon, Nasua, Cercoleptes.*
Family AILURIDÆ.	*Ailurus.*
Family URSIDÆ.	*Ailuropus, Ursus, Melursus.*

Before proceeding to express how far I completely concur in this arrangement, I will give my notes on the various genera, ending with what Professor Flower regards as the most aberrant type, and beginning with what is perhaps the most generalized form.

In beginning the Arctoid group, then, I take the genus *Procyon* as my type and standard of comparison.

The genus consists of two, if not three species, as correctly indicated by Dr. Sclater[1].

The oldest known form, that from North America, *P. lotor*[2], has been incorrectly divided into species which have been named respectively (1) *P. hernandezii*, (2) *P. hernandezii* variety *mexicana*, and (3) *P. psora*. These names, however, appear to have been given to what are but a few of many varieties of this very variable species. It is the northern species, extending from Alaska southwards to Costa Rica, the more southern forms showing a marked increase in size and in intensity of colour. The other certain species, the synonymy of which was put right by Dr. Sclater[1], is *P. cancrivorus*, a South-American form, ranging from Colombia and Guiana, but which also reaches as far north as Panama. The Raccoons, which are yet further south, and extend through Brazil down to Paraguay, form not improbably a third distinct species of *Procyon*, distinguished (as Dr. Sclater has remarked) from *P. cancrivorus* by having darker feet, and so may be found to merit the designation *P. nigripes* which I would propose to bestow on it[2].

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[1] See P. Z. S. 1875, p. 421.

[2] *Mapach quanhpecotli*, Hernandez, De Quad. Nov. Hisp. Folio I. Cap. 1. 1651.
Ursus cauda elongata, Linnæus, Syst. Nat. 1735, p. 35.
El Amerikanstet, Diur, Konigl. Vetenskaps Akad. Handl. 1747, p. 277, tab. ix.
Ursus lotor, Linnæus, Syst. Nat. (ed. 10) i. 1758, p. 48 (ed. 12) i. 1766, p. 70; Erxleben, Syst. Reg. Anim. 1777, p. 165; Schreber. Säug. iii. 1778, p. 521, pl. 143; Gmelin, Syst. Nat. i. 1788, p. 103; Harlan, F. A. 1825, p. 23.
Procyon lotor, Storr, Prod. Meth. Anim. 1780; Desmarest, Mammalogie, 1820, p. 168; Griffith's Cuvier, v. 1827, p. 114; Fischer's Synopsis, 1829, p. 147; Audubon and Bachman, vol. ii p. 47, pl. lxi.; Wagner's Supplement, Abth. ii. 1841, p. 154; Isid. Geof. St.-Hilaire, Zool. Voy. Venus, p. 125, pl. vi.; P. Gervais, Mammifères, vol. ii. (1855) p. 24; Allen, Bull. U. S. Geol. Survey, vol. ii. p. 325; Baird, Mamm. N. Amer. p. 207; Alston, Biologia, p. 69; Dr. Clinton Hart Merriam, Trans. of Linn. Soc. of N. York, Dec. 1882, vol. i. p. 71.
P. hernandezii, Wagler, Isis, 1831, p. 514; Baird, Mamm. N. Amer. p. 212,

The latest description of the habits of the Raccoons is that given by Dr. Clinton Hart Merriam in his account, before referred to, of the fauna of the Adirondack region. He tells us that the Raccoons do not like the dense evergreen forests but more open woods; that they are the most strictly nocturnal of all Mammals except Bats and Flying Squirrels, and yet that they may sometimes be seen abroad on cloudy days. They like to play in shallow water, and overturn stones to search for crayfish. They gather mussels, and seek for fish which may be detained in shallow pools. They are good swimmers, but cannot dive in pursuit of prey. Though not arboreal, they are good climbers, making their homes in trees, but carrying on their business elsewhere; they do not pursue their prey to the tree-tops, as do the Martens, or gather nuts as do the Squirrels. They appear to make a fair defence, an "old Coon being a tough match for an average Dog;" they are very expert in breaking down the stalks of corn, and stripping the husks from the ear, using their fore paws as we do our hands. Though very sly, they are caught in traps. They are not swift runners, and if pursued take to a tree, when they may be readily killed. Though capable of being made pets of, they cannot be let loose with impunity, on account of their great curiosity, which leads them to find their way,

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and Report United States Mexican Boundary Survey, ii. Mammalia, p. 22; Frantzius, Arch. f. Naturg. xxxv. i. p. 291.

P. nivea, Gray, Mag. Nat. Hist. i. p. 580.

P. psora, Gray, *ibid.* x. (1842) p. 261.

Raccoon, Pennant, Hist. Quad. 1781, no. 178.

Raton, Buffon, Hist. Nat. viii. p. 327, pl. 43–46; F. Cuv. Mamm. ii.

Anatomy of:—Dr. H. Allen, Proc. Acad. N. S. Philad. 1882, p. 115; Dr. M. Watson, Proc. Roy. Soc. (1881), vol. 32. p. 272.

[1] See P. Z. S. 1875, p. 421.

[2] *Ursus cancrivorus*, Cuvier, Tabl. El. d'H. N. des Animaux, p. 113 (1798).
Procyon cancrivorus, Wagner, Suppl. Abth. ii. p. 160.
Raton Crabier, Buffon, Supplement vi. p. 236, pl. 32.

The above are the synonyms of *P. cancrivorus*. Those of *P. nigripes* are:—
Black-footed form, Sclater, P. Z. S. 1875, p. 421.
P. cancrivorus, Prince Maximilian von Neuwied, Beitr. ii. p. 301, and Rengger, Paraguay, p. 113, and Wiegm. Archiv, iii. i. p. 371.

if possible, into their master's house, and there examine everything especially in a pantry, where everything will be tasted by them; they are very fond of sweetmeats and preserves; they will remove covers from dishes and corks from bottles, and soon learn to unlatch doors, using their hands much as Monkeys do theirs.

They hibernate early, becoming active again in February or March, in the Adirondack region, where they generally breed early in April, having from four to six young at a birth, which remain with the mother about a year. They commonly live and travel about in small companies; they do not return to the same nest every morning, often going in various directions for several days. They live well in confinement, and sometimes breed.

Doubt has been thrown on the often asserted habit of the Raccoon of soaking his food in water. I have been careful, however, to ascertain from Mr. Bartlett that the animal really does so.

Procyon differs from all Æluroids in the length and mobility of the digits of the manus. Unlike all but *Cynogale*, *Rhinogale*, *Crossarchus*, and *Suricata*, there is no median groove to the nose and the upper lip is not medianly cleft. The soles are naked, from the wrist and the heels forwards. The claws are considerably curved and moderately sharp, but they are non-retractile.

The muffle is naked and large, and projects a little forwards above the nostrils, which are each crescentic, with the convexity downwards, and extend to the hinder border of the naked muffle. The whiskers on each side have 5 or 6 bristles grouped together, and there are four sets of such groups. There is also a tuft over the eye, one behind the angle of the jaw, and one under the middle of the chin.

The ears are moderately large, subovate, and rounded above, and are covered with hair except around the meatus.

The length from the nose to the root of the tail is about 22 inches, that of the tail (not counting the length of the hairs beyond the fleshy tip) is about 9 inches, and the length of each limb somewhat about 8 inches. There are 14 dorsal, 6 lumbar, 3 sacral, and from 16 to 20 caudal vertebræ. Taking the length of the spine[1] at 100, the proportional length of the neck is 16·9, of the dorsal vertebræ 41·9, of the lumbar region 28·7, of the sacrum 12·3, and of the tail 78·9; that of the whole fore limb is 74·5, of the humerus 27·4, of the radius 28·7, of the metacarpus 7·6, of the third phalanx of the third digit manus 2·7; of the whole pelvic limb 91·7, of the femur 32·3, of the tibia 33·9, of the metatarsus 10·6, and of the third phalanx of the third digit 2·7.

The relative length of the skull[2] is 28·2, of the palate 24·1, its breadth 6·5, the breadth of the zygomata 20·2, of the brain-case 12·8, and of the interorbital part behind the postorbital processes 6·8. The relative length of the lower dental series from the front of the canine to behind the last lower molar is 13·9. Taking the length of the skull from the basion to the front of the premaxilla at 100, that of $\frac{\text{P. 4}}{}$ is 7·7, of $\frac{\text{M. 1}}{}$ 8·7, breadth of $\frac{\text{M. 1}}{}$ 8·7, length of $\frac{\text{M. 2}}{}$ is 5·8, of $\frac{}{\text{M. 1}}$ 10·6, and of $\frac{}{\text{M. 2}}$ 9·7. Comparing these proportions with those which exist in Æluroids and in the Dogs as exemplified by the Dingo, we find that the cervical region of the Raccoon, 16·9, is much less than that of the Dog, 26·2, a proportion only exceeded by *Cynogale* (26·6) and *Viverricula* (27·4) amongst the *Viverridæ*, and not equalled by any Feline form, though it is exceeded by the Hyænidæ (27·9–32·9). The Raccoon's neck is shorter that that of any Æluroid, being most nearly approached by *Arctictis*, in which it is 18·8 compared with the spine at 100.

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[1] From the front of the atlas to the hinder end of the sacrum.

[2] From the basion to the front of the premaxilla.

Similarly the dorsal region of the Raccoon (41·9) exceeds that of most Æluroids, the only relatively longer dorsal regions being those of *Paradoxurus* (43·8), *Arctictis* (44·8), *Cynogale* (43·1), *Suricata* (45·4), *Galidictis* (42·2), and *Crocuta* (45·6); while it may be as small in *Genetta* as 34·4; that of the Dingo is 46·1—the longest of all.

The length of the lumbar region, which is relatively 28·7, is smaller than in any Cats (where it ranges from 32·5 to 37·4) and smaller than in any other Æluroids except *Viverricula* 23·2, *Arctictis* 27·2, *Cynogale* 25·0, *Crossarchus obscurus* 26·3, *Suricata* 25·8, and *Crocuta* 17·0, which is the smallest of all. In the Dingo it is 21·4.

The sacrum (12·3) is of exceptional length, being twice that of the Dingo (6·0), while in the Cats it ranges from 7·8 to 5·5. The shortest Æluroid sacrum is that of *Cynogale* (5·1), and the longest that of *Crossarchus obscurus*, 10·9.

The relative length of the pectoral limb, 74·5, greatly exceeds that of the Dingo (68·4). In the Cats it may range from 61 to 78. It exceeds that of every non-feline Æluroid, being most nearly approached by *Proteles*, where it is 74·0.

The length of the pelvic limb, relatively 91·7, greatly exceeds that of the Dingo, 78·5, and is only exceeded by that of some Cats, where it is 93·8. In non-feline Æluroids it ranges from 55·6 (*Viverra*) to 79·9 (*Suricata*) and 80·1 (*Galidictis*).

The relative length of the humerus, 27·4, is greater than that of the Dingo (23·8), and greater than that of any Æluroid except some Cats, where it may be 28·5. In *Viverra* it is but 16·3.

Similarly the radius, 28·7, is greater than that of the Dingo (24·6), or of any Æluroid, where it ranges from 27·4 (some Cats) down to 13·8 (*Viverricula*).

The longest (third) metacarpal, 7·6, is shorter than that of the Dingo (9·2), or of most Cats, where it may be 10·9, or of the Hyænidæ, where it may be (in *Proteles*) 12·5. On the other hand, it may be as short in the *Viverridæ* as 4·2, which is its relative length in *Cynogale*.

The ungual phalanx, 2·7, is about the proportion of that of the Dingo, which is 2·5; that of the relatively longest Viverrine being 4·5 (*Suricata*), and the shortest 13 (*Viverra* and *Genetta*).

The relative length of the skull from the basion to the premaxilla is 28·2, which exceeds that of the Dingo or any Dog or Cat and most Viverrines, being slightly exceeded by that of *Genetta, Herpestes, Cynictis, Hemigalidia*, and most of all by *Cynogale*, where it reaches 29·5.

The palate is relatively 24·1, which is more than double the average of the Feline palate's length, and much more than that of any Viverrine, the largest of which (*Herpestes*) is but 17·9. That of the Dingo is 13·8.

The relative breadth of the palate is 6·5, which is less than that of the Dingo (7·0) or of any Cat, and is hardly more than half that of *Crocuta*, while in *Suricata* it is 10·0. It is a little wider than that of *Viverra* or *Arctictis*, while that of *Eupleres* is only 3·9.

If we estimate the length from the basion[1] to the anterior edge of the premaxilla at 100, the length of the palate is 85·4, which greatly exceeds that of any Æluroid, where it ranges from 43·4 (some Cats) to 61 or 62 (some *Herpestes, Crossarchus*, and *Bdeogale*). In the Dingo it is 54·7.

The breadth of the palate thus estimated is 23·3, while in the non-feline Æluroids it varies from 16·8 (*Eupleres*) and 18·4 (*Arctictis*) to 49·3 (*Crocuta*). In the Cats it varies from 39·1 to 46·9, and in the Dingo it is 27·6, just what it is in *Viverra*.

The greatest breadth of the zygomata is 71·8, which exceeds that of the non-feline Æluroids except the Hyænas, where it may be 83·4. In the Cats it may be 89·3. In the Dingo it is 61·6.

The greatest breadth of the brain-case is 45·6. In the Æluroids it ranges from 27 (*Hyæna brunnea*) to 50·8 (*Suricata*) and 54·5 (some Cats). In the Dingo it is 34·9.

The narrowest interorbital or postorbital breadth is 24·2. In the Æluroids it may be only 15·6 (*Viverricula*) and 14·0 (*Cynogale*), or it may be 26·3 (*Suricata*) or 27·5 (*Galidia*). It is 22·0 in the Dingo.

The length, thus estimated, of the fourth upper premolar is 7·7. In the Æluroids it varies from 4·9 (*Arctogale*) to 16·4 (*Crocuta*). In *Viverra* it is 11·1, and in the Dingo it is 10·3.

The length of the first upper true molar is 8·7. In the Æluroids it varies from 1·3 (*Crocuta*) to 5·6 (*Hemigalea*). In *Viverra* it is 5·2, and in the Dingo it is 6·9.

The breadth of the same tooth is also 8·7, while in the Æluroids it ranges from 1·7 (*Crocuta*) to 10·5 (*Suricata*). In *Viverra* it is 9·7, and in the Dingo it is 9·4.

The relative length of the second upper true molar is 5·8. In the Æluroids it may be only 1·2 as in *Genetta*, or it may reach 5·2 in *Cynogale*. In *Viverra* it is 2·9, and in the Dingo it is 3·1.

The proportion borne by the pelvic limb (femur, tibia, and pes) to the entire pectoral limb taken at 100, is 123·1. In the non-feline Æluroids it ranges from 94·4 (*Crocuta*) to 136·4 (*Viverricula*). In the Cats it may be 113·1 or 136·4 (the Eyra), the average being 119·4. In *Viverra* it is 127·9, and in the Dingo it is 114·6.

Compared with other Arctoids, *Procyon* has the relatively longest limbs, compared with the length of the spine. It has also the longest radius, tibia, metacarpals and metatarsals, and palate.

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[1] *I. e.* front margin of foramen magnum.

In the skull the alisphenoid joins the parietal[1], but the ascending process of the premaxilla does not attain the descending process of the frontal[2]. The palatine bone joins the orbito-sphenoid, and the postaxial process of the premaxilla is separated mostly, if not always, from the preaxially extending process of the frontal, by the junction of the nasal with the premaxilla. The malar joins, at least sometimes[3], the lachrymal bone, and forms part of the margin of the infraorbital foramen. The maxillary bone forms a floor to the orbit much as it does in *Canis*, and therefore to a less extent than in *Felis*. The palate extends back much beyond the last molars. The postorbital processes are very small; the subangular process of the mandible is rudimentary. The form of the *basis cranii* has been described and figured by Professor Flower (P. Z. S. 1869, p. 9, fig. 3, p. 10).

The scapula has a remarkably large supra-spinatus fossa, and its metacromion is, as a rule, developed much as in the Civet. The humerus is perforated by a small supra-condyloid canal. The femur has the upper part of its posterior surface somewhat flattened. The ungual phalanges are somewhat intermediate in form between those of the Civet and those of the Dog.

Molar formula = P. $\frac{4}{4}$, M. $\frac{2}{2}$.

The teeth remind us rather of those of some of the Paradoxures than those of any other Æluroids or Cynoids, but the non-sectorial character of the Paradoxurine teeth is here carried still further. The last, or fourth, upper premolar and the two upper molars have each three roots. The second and third upper premolars have each two roots. All the lower grinders except the first premolar have also each two roots. The fourth upper premolar is not at all sectorial in character. It has three external cusps (the middle one of which is much the largest) continuous with a small external cingulum, and two internal cusps placed opposite the interspaces of the three external cusps. The first upper molar differs from that of every Æluroid or Cynoid in that it is no broader anteriorly than it is posteriorly. It has four large cusps, whereof the two outer ones are of equal size and rather more distant from the external cingulum than in the fourth upper premolar. There is also a minute cusp developed from an internal cingulum, and situated inside the postero-internal cusp. The second upper molar has four cusps. Two of these are external, the anterior one of the two being the larger. Of the internal the hinder one is very small. The fourth lower premolar has one principal cusp, with a minute one at its base in front, and two considerable-sized ones attached to it behind. These accessory cusps are larger than they are in the Dogs, and especially the one behind the principal cusp is more equal to the latter than it is in them. The first inferior true molar is not at all sectorial. It has two inner and two outer cusps and another (fifth) antero-internal cusp. The hindermost internal cusp may be subdivided into two smaller ones. Although this tooth is much like the corresponding one of the Civet, only the antero-external and the antero-internal cusps do not preponderate in height as in that animal. The two hinder cusps (one internal, the other external) correspond with the "heel" of the dog's tooth, while the more anterior part corresponds to the whole of the crown of the corresponding tooth of *Felis*. This "heel" in *Procyon* forms nearly half the tooth, and rises nearly as high as does the more anterior portion. It is very like the same tooth as it may be seen in *Paradoxurus*.

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[1] In this matter *Procyon* agrees with *Felis, Viverra, Paradoxurus, Arctictis, Cynogale, Herpestes, Suricata, Hyæna,* and *Crocuta*, as well as many forms of *Canis*, though I find that sometimes in *Canis* the squamosal joins the frontal, as in the Wolf and Kit Fox.

[2] I have noticed this junction to occur in *Hyæna*, except *H. brunnea, Crocuta, Herpestes, Arctictis*, sometimes in *Felis*, and most markedly so in *Suricata*, where the summit of either premaxilla ascends a little the inner side of the descending process of the frontal. In *Viverra, Paradoxurus, Cynogale,* and generally in *Felis*, the premaxilla and frontals do not meet.

[3] Cuvier, Leçons d'Anat. Comp. vol. ii.

The second lower true molar is quinquecuspidate like the first, only the azygos cusp is placed behind, instead of in front of, the two pairs. It is an exaggeration of the same tooth as found in *Paradoxurus*, but is more equal in size to the tooth in front of it.

The muscles have been described by Dr. Harrison Allen[1]. The tongue is medially grooved at its anterior half and provided with a lytta which is relatively a little longer than in the Cats. The tongue is covered with small conical papillæ, and fungiform papillæ are scattered amongst them. The flattened papillæ are moderately developed. There are ten, twelve, or fourteen rather small circumvallate papillæ in two rows forming an acute angle open forwards, with five, six, or seven in either row.

The descending aorta, after giving off in front its inferior mesenteric artery, gives off, on either side, an external iliac artery, and a little beyond divides into two internal iliacs, from the bifurcation of which a small mid sacral artery continues on to the tail. The arch of the aorta gives off one great innominate artery, one left subclavian.

The lungs are as usual in the Carnivora. The kidney has a single mamilla. The intestine in one instance presented a singular and very exceptional and elongated dilatation between the small and large intestine. This was in no wise in the form of a cæcum, but merely a dilatation of part of the course of the intestine.

The liver has its right half, rather, or very much, the larger. The left central lobe is simple and rather, or very, small. The bladder appears on the diaphragmatic aspect, through a perforation or a notch. The caudate lobe is moderate, and the Spigelian small. That part of the right central lobe which is on the left side of the bladder, is deeply furrowed. It has the pair of simple anal glands usual in the Carnivora.

The bone of the penis is very large; and in one instance the vasa deferentia opened upon the dorsal aspect of the urethra.

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[1] See Proc. Acad. Nat. Sc. Philadelphia, 1882, p. 115.

The female generative organs and placentation have been described by Dr. M. Watson[1]. According to this observer, the placenta forms a complete ring, but at the widest part, opposite the back of the fœtus, he found a spot similar to that figured by Daubenton[2] in the placenta of *Martes domestica*, and described by Bischoff in that of *Lutra vulgaris*[3], *Mustela foina*, and *Mustela martes*[4], where the substance of the placenta was very defective. *Procyon* agrees with *Canis* and differs from *Felis*, "in the absence of a continuous layer of *decidua serotina* from the uterine surface of the detached placenta." It differs from all Carnivora yet known in having the fœtus provided with an extra article, or *epitrichium*; a structure found in *Cholœpus hoffmanni*, *Bradypus*, *Myrmecophaga*, *Dicotyles*, *Sus*, and *Equus*. It also agrees with *Cholœpus hoffmanni* in the possession[5] of certain peculiar placental vessels not hitherto found in any other animals. Dr. Watson finally records that it "differs from every other Carnivore, the fœtus of which has been hitherto examined, in the non-possession of an umbilical vesicle."

The brain[6] shows a parietal gyrus which does not bifurcate posteriorly as it does in the *Cynoidea*. The Sylvian gyrus has its anterior limb much smaller than its posterior limb. The parietal gyrus is large, expanding anteriorly, becoming considerably contorted, and sometimes communicating, by a bridge of convolution, with the sagittal gyrus. The sagittal gyrus is very large, and becomes complicated anteriorly. In *P. cancrivorus* there are two or three bridging convolutions on each side, between the parietal and the sagittal gyri. The hippocampal gyrus continues upwards into the sagittal gyrus behind the cranial sulcus[7], the calloso-marginal sulcus not being continued forwards into the latter. The crucial sulcus is very large and distinct, and sends forwards and inwards a small precrucial sulcus, thus defining, with its fellow of the opposite side, a conspicuous diamond-shaped patch of brain-substance, which has been called the "Ursine lozenge."

The genus *Nasua* comprises two species, *N. narica*[8] and *N.*

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[1] See Proc. Royal Soc. 1881, vol. xxxii. p. 272.

[2] Buffon, Hist. Nat. vol. vii. pl. xx.

[3] Sitzungsb. Akad. Wissensch. München, 11 März, 1865.

[4] Ibid. 19 Mai, 1865.

[5] See Prof. Turner's paper, Trans. Roy. Soc. Edin. vol. xxvii. p. 79.

[6] See a paper entitled "Notes on the Cerebral Convolutions of the Carnivora," in the Journal of the Linnean Society, vol. xix. (1885), p. 10.

[7] As in the *Felidæ*.

[8] *Nasua*, Storr, Prod. Meth. Mamm. p. 35 (1780).
Caoti, Lacépède, Mém. de l'Hist. Nat. iii. p. 492 (1801).
Viverra narica, Linn. Syst. Nat. i. p. 64 (1766).
Coati mundi, Brisson, Règne Anim. 1756, p. 262.
Coati brun, Buffon, viii. 1760, p. 358, pl. 48.
Nasua narica, Allen, Bull. U. S. Geol. Survey, v. p. 162.
Nasua leucorhynchus, Tschudi, Fauna Peru, p. 100 (1846); Frantzius, Arch. f. Naturg. xxxi. i. p. 292; Hensel, Abh. Akad. Berlin, 1872, p. 65.
N. fusca, Tomes, P. Z. S. 1861, p. 280.
N. solitaria, var. *mexicana*, Weinland, Zool. Garten, 1860, p. 191, pl. 1.
N. naria, Alston, Biologia Centrali-Americana, Mammals, 1879, p. 74.

rufa[1], and is represented by one or other of them from Texas to Paraguay.

It inhabits the mountain tracts of Costa Rica at a height of from 6000 to 7000 feet above the sea. Belt[2] observed it pursuing large Iguanas, but they, when surprised asleep, usually dropped and escaped to another tree; yet the attempt would be continued again and again. He noticed it hunting in large bands, some individuals hunting over the ground and others in the trees, so that the prey had little chance of escape. In Guatemala it is one of the commonest mammals, ranging from the woods of the coast up to forests at a height of 9000 feet. The Coatis are very easily tamed, and are often seen in Spanish American houses, chained to one of the pillars of the corridor surrounding the courtyard. They are very variable in colour apart from differences of age and sex.

The claws are of considerable size and much longer and stouter than those of *Procyon*. The digits also are much more united by skin, which extends down them as far as the penultimate joint of each.

The nose is produced into a short proboscis, the end of which is naked, and has its upper margin much the most projecting. There is no median groove to either nose or lip, but there is a lateral notch in the margin of either nostril. The snout is surrounded by the usual nasal cartilages, much enlarged, and appearing to be more or less fused together. It has a longer, slender, median dorsal cartilage.

The ears are very hairy within as well as without. There is a very small tragus and a small bifurcating antitragus. The vertical ridge, ascending from the tragus to the helix, flattens out above. The anthelix is prominent and sharply defined; the prominence below it is much less so.

The palmar and plantar surfaces are naked. Six mammæ are described as existing.

There are 14 dorsal, 6 lumbar, and 3 sacral vertebræ as in *Procyon*, and from 19 to 23 caudal vertebræ. The dimensions are given in the tables annexed to this paper, and also the proportions, of which there need here be mentioned only the fact that the relative length of the pelvic limb to the spine is greater than in any

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Quauhpecotl, Hernandez, De Quad. N. Hisp. Fol. 6, cap. 17.

Pisoti of Spanish Americans.

Nose and edge of upper lip white; face and cheeks dark brown; fur long and soft, the long hairs of dorsal surface tipped with rufous, fulvous, or whitish; tail of same colour as back, or with half rings on lower surface of basal half.

Range from Texas to Panama, perhaps to Colombia (Tschudi's specimen said to be Brazilian was probably not so).

[1] *Coati*, Marcgrave, Hist. Nat. Brazil, 1648, p. 228; Azara, Hist. Nat. Paraguay, i. 1802, p. 293.

Coati noirâtre, Buffon, viii. 1760, p. 358, pl. 47

Coati à queue annelé, Brisson, Règne Anim. 1756, p. 263.

Viverra nasua, Linn. Syst. Nat. i. 1766, p. 64.

Fur generally short and harsh; long hairs of dorsal surface usually black-tipped; ears rather large and pointed; tail conspicuously annulated with 7–9 broad fulvous or rufous rings alternating with black ones.

Brazil; Paraguay.

[2] Naturalist in Nicaragua, p. 339.

other Arctoid except *Procyon*, where it is still longer and where the radius is at its maximum of relative length in that group. The length of the skull compared with that of the spine is greater than in any other Arctoid except *Melursus*, while the relative breadth of the skull behind the postorbital processes is at its maximum. When compared with the total length of the skull, the palate of *Nasua* is lower than in any other Arctoid except *Procyon*, and the length of the pelvic limb, compared to that of the pectoral one, only attains the same proportion in *Lutra*.

As to the skull, the form of the auditory bulla and parts adjacent has been described by Professor Flower[1]. The muzzle is longer, and more upturned towards the apex than in the skull of *Procyon*; the frontal region also is more convex and swollen; the mastoid process[2] is less prominent, the paroccipital process less prominent and more applied to the bulla. The bulla is more inflated, the carotid foramen situated more forwards, and the condyloid foramen is smaller and less conspicuous.

The palate is not only much prolonged behind the last molars, but remains very broad there. The maxilla forms, indeed, but a very small bony floor to the orbit. The mandible has no subangular process, and the angle is very small and less produced and pressed upwards than in *Procyon*. Sir Richard Owen remarks (Anat. of Vertebrates, vol. ii. p. 501) that in *Nasua* "the olfactory chamber, with the superior turbinals, extends above the whole rhinencephalic fossa, and forms in part the frontal elevation of the cranial contour."

The ulna is much broader and less slender than in *Procyon*, and the fibula is more divaricated from the tibia. The pollex and hallux are also rather longer in proportion to the longest digits.

Molar formula $= \text{P.}\ \frac{4}{4}, \text{M.}\ \frac{2}{2}$.

The first premolar, both above and below, has two roots. Compared with the teeth of *Procyon*, those of *Nasua* have the following characters:—The fourth upper premolar has the postero-inner and principal outer cusps less developed. In the first upper molar, the internal cingulum is obsolete. The second upper molar is tricuspid instead of quadricuspid, the postero-internal cusp being generally obsolete.

In the first lower true molar the antero-internal cusp may be wanting, and the postero-internal may be smaller than in *Procyon*. The second inferior molar may be without the fifth or median and hindmost cusp of the Raccoon.

In the milk dentition, the first upper deciduous molar is a simple conical tooth. The second one is similar, save that it has a small posterior cusp. The third upper molar is unlike any other tooth I have seen, approaching nearest to the first upper molar of *Procyon*, and the fourth upper deciduous molar of *Cynogale*. The tooth is broadest behind. It has one principal external cusp with an accessory one in front of it, and another behind it. There is also a strongly marked internal cingulum. The fourth deciduous upper molar is like the first upper true molar. The fourth lower deciduous molar is like the first lower true molar, but with a larger keel, so that its form is intermediate between that of the first and that of the second lower true molars. The submaxillary gland is small, but the parotid is exceedingly small.

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[1] *Loc. cit.* p. 9.

[2] The mastoid process is almost, if not quite, as prominent in the Æluroid *Nandinia* (see P. Z. S. 1882, p. 170) as it is in *Nasua*. In *Nandinia* it is also as prominent as it is in *Canis, Bassaris, Ailurus, Galictis, Ictonyx*, or *Helictis*, and it is more prominent than it is in *Mydaus, Mustela*, or *Putorius*. On the contrary, it is not so prominent in *Nandinia* as it is in *Procyon, Meles, Taxidea, Arctonyx, Gulo, Mephitis, Conepatus, Mellivora, Lutra*, or *Enhydra*.

The tongue has a well-developed lytta. All the papillæ are small except the flattened papillæ, which are a little larger than in *Nandinia*. The circumvallate papillæ are very small, in two rows forming an acute angle open forwards.

The liver resembles that of *Procyon*, except that that part of the right central lobe which is on the left side of the gall-bladder is smaller and not furrowed, and that the caudate lobe is larger.

The two anal glands are very peculiar. Each has four small pouches, which recede from its fundus, and are surrounded by glandular structure.

The brain [1] shows but a very indistinctly marked Ursine lozenge, and the calloso-marginal sulcus does not run on into the cranial sulcus. The sagittal gyrus is more complicated than in *Procyon*.

Cercoleptes [2].—The Kinkajou is found from Central Mexico down to the Rio Negro of Brazil. Messrs. Godman and Salvin remark that it is not rare in Guatemala, and ranges up to 4000 or 5000 feet. One, which was met with there, feeding on fruit in a tree overhanging the river, and which was wounded, fell into the river, the stream of which it swam in without difficulty. It is an animal easily tamed, living in captivity on oranges and bananas, which it greedily eats. It is not umcommonly found in holes of trees, where it lies concealed during the day, issuing forth at night in pursuit of small animals and birds. Its thick, somewhat woolly fur is much valued, and skins are brought to the market. Dampier in his 'Voyages' (vol. ii. p. 59) observes :—"The skin is covered with short, fine, yellowish hair. The flesh of it is good, sweet, and wholesome meat. We commonly skin and roast it, and then we call it Pig, and I think it eats as well."

In this animal we again meet with the median nasal groove so generally present in Æluroids; the head is broad and round, with a short muzzle, the ears short and rounded. The body is long with short limbs, very long and prehensile tail, and the claws very long and strong, sharp-pointed and much curved. The palmar and plantar surfaces are naked.

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[1] See the paper on the Convolutions before referred to, p. 11, fig. 1.

[2] *Viverra caudivolvulus*, Pallas in Schreber's Säugeth. iii. p. 453, pl. 125 B.
Kinkajou, Buffon, Supp. iii. p. 245, tab. 50, 51.
Potos caudivolvulus, Desm. Mamm. p. 171.
Cercoleptes caudivolvulus, Illig. Prodr. p. 127; Schomburgk, Ann. Nat. Hist. 1840, p. 29; Wagner, Supp. ii. p. 170; Owen, P. Z. S. 1835, p. 119; Tomes, P. Z. S. 1861, p. 280; Biologia. p. 76; De Blainville, Ostéographie, *Subursus*; Gervais, Mam. vol. ii. p. 23.

There are 14 dorsal, 6 lumbar, 3 sacral, and 26 caudal vertebræ. The dorsal region is relatively shorter, and the lumbar and tail longer than in any other Arctoid. It has the relatively shortest first lower true molar. There are small rudimentary clavicles. The inner condyles of the humerus may or may not be perforated[1].

To the characters already pointed out by Professor Flower[2] may be added the conspicuousness of the stylo-mastoid foramen and the flattened, broadened-out condition of the basis cranii external to it. The palate is not prolonged as in *Procyon* and *Nasua*, behind the molars, a peculiar pointed process projecting backwards from its hinder edge behind each last molar.

Strong postorbital processes project both from the frontals and the molars. The alisphenoid is widely separated from the parietal by the wide junction between the squamosal and the frontal. The palatine also joins the orbitosphenoid. There is a very large infraorbital foramen. The palate is very slightly arched, with an antero-posterior convexity. The lachrymal foramen is placed very low in the orbit.

The mandible differs greatly in shape from that of any other Carnivore, and much resembles that of the Lemuroid, *Microrhynchus*. The inferior margin of its horizontal ramus is concave; the symphysis is very long, and the postero-inferior part of the mandible is greatly expanded, the angle projecting downwards as well as backwards. There is no subangular process. The coronoid process is much prolonged upwards, and may sometimes incline a little forwards rather than backwards.

Comparing this most arboreal Arctoid with *Arctictis*, the most arboreal Æluroid, one is struck with the similarity which exists in the proportional length of the limbs, and in the presence of the chevron bones beneath the tail, of which there are here seven.

The ultimate phalanges are more elongated and curved than in *Procyon* and *Nasua*; but there are no large bony plates to sheath the bases of the claws as in the Cats, nor have the penultimate phalanges the feline lateral excavation.

Molar formula $= \text{P. } \frac{3}{3}, \text{ M. } \frac{2}{2}$.

The molars are very simple in structure, with low flat crowns, though essentially like those of the two preceding genera. The fourth upper premolar and first upper molar are formed on the same type as those of *Procyon*, but the cusps are much less developed. The second lower molar is rather smaller in comparison with the first one than is the case in *Nasua* and *Procyon*. The other lower molars are formed on the same type as those of the two last-mentioned genera, but are more flattened on the surface and less tuberculate.

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[1] Sir Richard Owen (in his Anat. of Vertebrates, vol. ii. p. 509) says:—"I have seen the condyle notched in the right, and perforated in the left humerus."

[2] P. Z. S. 1869, pp. 9, 10.

For an account of the myology of *Cercoleptes*, see J. Beswick Perrin, Proc. Zool. Soc. 1871, p. 547.

The tongue is long, narrow, and exceedingly extensible. The circumvallate papillæ are as in *Nasua*. The fungiform papillæ are scattered over the surface generally. There is a rounded patch of somewhat elongated conical papillæ in the middle of the dorsum. There are no marked flattened papillæ. The lytta is very elongated and stout.

The liver is very like that of *Nasua*, but the cystic notch is deeper.

There are the two normal anal glands.

The lungs present four lobes on the right side, and two on the left.

The thyroid cartilage is, as in *Canis*, much deeper in front medianly than in Æluroids. It is indeed deeper or narrower there than elsewhere, whereas in all the Æluroids I have examined it is narrower in the middle than anywhere else.

The external ear has no pouch. The conch is rather smooth. There is a tragus and an antitragus and a ridge-like supratragus (the front end of which is most prominent), with a vertical ridge in front of it, which ends superiorly within the anterior margin of the conch.

The brain is short and rounded. The Ursine lozenge is not strongly defined. The cranial and calloso-marginal sulci join[1].

Ailurus[2].—This, the first Old-World Arctoid we have to consider, is found in the South-eastern Himalayas amongst rocks and trees at an elevation of from 7000 to 12,000 feet. It feeds mainly on fruits and other vegetable matters. The Panda has a broad, short face, small eyes, large, erect, pointed ears, and a naked end to the muzzle. The limbs are stout, and the locomotion is plantigrade, although the palmar and plantar surfaces are almost entirely hairy. The claws are large but blunt. and not at all retractile.

The vertebræ are 14 dorsal, 6 lumbar, 3 sacral, and 18 caudal. The length of the second inferior true molar, compared with that of the skull, is greater than in any other Arctoid.

To the cranial characters already described by Professor Flower, the following notes may be added :—Though the muzzle is so short, yet it is upturned distad in a way which recalls the form of the skull of *Nasua*. The zygomata are more arched, both upwards and outwards, than in the hitherto described genera, but most resembling, of the three, the condition existing in *Procyon*. The infraorbital foramen is large. The palate is curiously arched, being strongly convex antero-posteriorly. It is greatly narrowed behind the last molars, and hardly more relatively prolonged there than in *Cercoleptes*. The sagittal ridge is rather strong.

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[1] See P. Z. S. 1869, p. 13.

[2] *Ailurus fulgens*, F. Cuv. Mamm. iii. 50 livr.; (*Panda*) Hardwicke, Linn. Trans. xv. p. 161, pl. 2; Wagner's Supp. vol. ii. p. 177; Gervais, Mamm. ii. p. 23; Brian Hodgson, Journ. Asiat. Soc. Bengal, vol. xvi. p. 1113 (1847), where an account of the animal's habits is given; Gray, P. Z. S. 1864, p. 708 (with figures of skull and palate); P. Z. S. 1869, pp. 278, 408–507, pl. xli.; Flower, P. Z. S. 1870, p. 752 (anatomy, with woodcuts); De Blainville, Ostéographie, *Subursus*, pl. vii.; Bartlett, on Habits in Captivity, P. Z. S. 1870, p. 769.

The mandible shows a coronoid process, which is loftier and arches more over backwards than that of any of the preceding genera. The inferior margin of the horizontal ramus is convex. There is no subangular process. The angle is very small, upturned, and little produced.

The phalanges are very broad, and the ultimate ones have, like those of the Cats, large bony sheaths to shelter the bases of the claws. Nevertheless the penultimate phalanges are not laterally excavated.

Molar formula $= \mathrm{P.}\ \frac{3}{4}, \mathrm{M.}\ \frac{2}{2}$.

The incisors are singularly small. The premolars and molars are very interesting to compare with those of *Procyon*. They are formed on the same type as are the latter, but present a wonderful exaggeration of their characters, and are exceptionally broad and multicuspidate. The second upper premolar is a rather large tooth with minute cusps on either side of the base of its great outer cusp, and it has an internal cingulum. The third upper premolar has three outer cusps which are continuous with an external cingulum. There are two internal cusps, whereof the anterior is much the smaller, and another minute cusp is developed from the internal cingulum. The fourth upper premolar has three outer cusps rather distinct from the external cingulum, two subequal internal cusps, and another good-sized cusp developed from the internal cingulum. The first upper true molar has two external and two internal principal cusps, a strong internal cingulum, and an external cingulum with two supplementary cusps and two vertical ridges. The supplementary cusps are placed one in front of and the other behind the antero-external principal cusp. The two vertical ridges descend and lose themselves upon the outer surface of the postero-external principal cusp. The second upper true molar has four main cusps with three external small ones developed from the external cingulum, and one internal cusp developed from the internal cingulum. The first lower premolar is minute and deciduous. The second is like a diminished fourth inferior premolar of *Procyon*, with the minute supplementary hinder cusps added to it. The third is still more like the fourth lower premolar of *Procyon*. The fourth is also like it, only that the first cusp is developed almost to an equality with the second, while the third and fourth cusps of the *Procyon* tooth are represented by a single cusp, which is also almost as large as the second cusp. There is also a median internal cusp. The first lower true molar is like the corresponding tooth of *Procyon*, but with the hindmost internal cusp represented by two small cusps, as it sometimes is in *Procyon*. The second lower true molar is like the first, except that the antero-internal cusp (*i. e.* the most anterior cusp of all) of the latter has disappeared, while an additional, median, large cusp appears at the hindermost part of the tooth.

The anatomy of the animal having been so fully described by Professor Flower, it is sufficient here to remark shortly that the tongue is pointed, covered with rather small conical papillæ, small fungiform papillæ being generally scattered over the surface. The flattened papillæ are inconspicuous, and the circumvallate papillæ are in two rows of about four each, forming an acute angle open forwards.

The liver has much the same general form as that of *Nasua*, but the right and left halves are pretty equal, and the caudate lobe is still larger.

The lungs have four right and two left lobes.

The heart is rounded, and the great vessels are given off as in the Genet.

The thyroid cartilage is Æluroid and not Cynoid in shape.

The os penis is much smaller than it is in *Procyon* and *Nasua*.

The anal glands are a single pair as usual.

The brain[1] shows but a feebly marked Ursine lozenge. The hippocampal and sagittal gyri join behind the crucial sulcus.

Ailuropus[2].—This very singular genus, comprising only one very rare species, is the giant of that Arctoid group of which the Raccoon is the type, being but a little smaller than the Brown Bear of the Pyrenees. From muzzle to tail-root it measures 1·50 m., and it stands ·66 m. high. It feeds on bamboo-roots and other vegetal substances. It inhabits the most inaccessible mountains of Eastern Thibet, from which it descends only to commit depredations in the plains. It is very bulky, with a short and exceedingly broad head, but the nose is small.

The tail is so short as to be hardly visible. The feet are short and rounded, and, as in the Panda, the palmar and plantar surfaces are hairy, and the locomotion is not fully plantigrade. The fur is very thick, like that of a Bear.

The skull is remarkable for its great sagittal crest, the shortness of the muzzle, and the enormous development of the zygomata, the extreme breadth between which is 89·3 compared with the length of the skull taken at a hundred. It is therefore greater than that of any other Carnivore, being most nearly approached by *Ailurus*, where it is 83·5, and *Hyæna brunnea*, where it is 83·4, and the relative length of the second upper true molar also here attains its maximum. The breadth between the orbits behind the postorbital processes (which are almost obsolete in both the frontal and the malar) is less than in any of the terrestrial Carnivores, being only 14·8. That of

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[1] See *l. c.* p. 12, and also P. Z. S. 1870, pp. 755–757, figs. 1, 2, 3, where this brain has been described and figured by Professor Flower.

[2] *Ursus melanoleucus*, A. David, Nouvelles Archiv. du Mus. t. v. Bulletin, p. 13.

Ailuropa melanoleucus, Alph. Milne-Edwards, Ann. des Sc. Nat. sér. 5, 1870, t. xiii. art. no. 10.

Ailuropus melanoleucus, A. Milne-Edwards, Nouvelles Archiv. du Mus. 1872, t. vii. Bulletin, p. 92, and 'Recherches pour servir à l'histoire Naturelle des Mammifères' (1868–1874), tome i. (text) p. 321, tome ii. (atlas) plates 50–56.

Cynogale is 14·0, while in *Lutra* the relative dimension may descend to 10·5. The snout is upturned towards its tip, and the interorbital surface is swollen and convex, thus recalling to mind the form of the skull of *Ailurus*. The infraorbital foramen is very low down and distant from the orbital margin, and the maxilla forms but a very small bony floor to the orbit. The palate does not project back quite so far as the posterior ends of the last upper molars. The mastoid process is very large and lamellar. The glenoid fossa is enormously broad. The condyloid foramina are very small. The bulla is moderately swollen, as in *Ailurus*, but very small relatively. There is a glenoid foramen, more or less hidden, but no alisphenoid canal. The mandible is very like that of *Ailurus*, with a very high coronoid process, a small angle pressed upwards, and no subangular process.

Molar formula, P. $\frac{4}{3}$, M. $\frac{2}{3}$.

The premolars are two-rooted, except the first upper premolar, which is very minute. The second has three lobes, whereof the median is very much the largest. The third has three external and three internal cusps, with a sixth very small accessory cusp between the antero-internal and the antero-external cusps. The fourth premolar has three external and three internal cusps, with a minute accessory cusp between the two internal cusps and an internal cingulum. The first upper true molar, which has a square grinding-surface, has two great external cusps, with a rudimentary tubercle in front of the more anterior of the two; also two large internal cusps and a very distinct internal cingulum. The second upper true molar is a most exceptionally formed tooth, having a grinding-surface covered with a great many minute prominences at its hinder part, with two distinct and large external tubercles, and at least one internal tubercle at its anterior part, the whole being bordered within by a very distinct internal cingulum.

The three inferior premolars increase in size equally and pretty regularly from before backwards, and the crown of each has three tubercles, the median tubercle becoming less predominant as the accessory tubercle increases in size from the first to the third premolar, those of the third being nearly equal-sized.

The first lower true molar is like the corresponding tooth of *Ailurus*, with slight superadded complications, with a large antero-internal cusp, and only a single undivided postero-internal cusp. The second molar is only quadricuspid, with no posterior tubercle or talon, because there is here a third molar. This last tooth is a large, flattened, rounded tooth, with an irregular surface. The brain bears a large ursine lozenge[1].

Bassaris[2].—This is a small American Arctoid genus, of slender form, with somewhat digitigrade feet and slender muzzle, but which is nevertheless allied to *Procyon*. Its two species range from the southern parts of the United States to Central America. The soles of the feet are hairy.

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[1] See the paper on the convolutions before referred to, p. 12.

[2] There are two species—*B. astuta* from Ohio, Oregon, Texas, California, North Mexico, and Vera Cruz; and *B. sumichrasti*, from the mountains of Mexico, Central America, and Costa Rica. See Biol. Centr. Am. Mammalia, p. 71, pl. vii.; Abh. Ak. Berlin, 1827, p. 119; (Wagler,) Isis, 1831, pp. 423 and 513; Water-

There are 13 dorsal, 7 lumbar, 3 sacral, and more than 23 caudal vertebræ. In addition to the cranial characters pointed out by Prof. Flower[1], which are very fully given, there is nothing which need here be noted beyond the relatively large size of the infra-orbital foramen and of the postorbital processes of the frontals. The palate hardly extends beyond the last molars, but the mesopterygoid fossa is very long.

Molar formula = P. $\frac{4}{4}$, M. $\frac{2}{2}$.

The teeth are like those of *Procyon*, except that the fourth upper premolar narrows posteriorly. It has three external cusps (whereof the middle cusp is much the largest), and two internal cusps, the posterior one of which is much the smaller. Thus, but for the second internal cusp, it would be like the corresponding tooth of *Paradoxurus*. It is a really sectorial tooth. The first upper molar is like the same tooth of *Procyon*, except that it is relatively broader;

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house, P. Z. S. 1839, p. 137, note; Flower, P. Z. S. 1869, pp. 31–34; Lichtenstein's Darst. neu. Säug. pl. 43; Charlesworth, P. Z. S. 1841, p. 60; De Saussure, Rev. et Mag. de Zool. 1860, p. 7, pl. i.; Peters, Monats. Berlin, 1874, p. 704, pls. i. & ii.; Baird, Mammals of N. Amer. p. 147, and Zool. of Mexican Boundary, part ii., Mammals, p. 17, pl. 14. figs. 2 *a–c*; Allen, Bull. U. S. Geol. Survey, vol. v. p. 336; Audubon, ii. p. 314, fig. 98; Paul Gervais, Voyage de la 'Bonite' (1841), and Mammifères, vol. ii. p. 42; De Blainville, Ostéographie, *Mustela*; Turner, P. Z. S. 1848, p. 81; Wagner, Säug. Suppl. vol. ii. p. 277.

This animal, called Cacomistle, is said to have somewhat the look of a Fox and the ringed tail of the Raccoon, and a body much like the Vison's. The fur soft, with long hairs interspersed. Ears well developed, erect, and pointed, almost naked externally, but clothed with short hairs within. The posterior edge is split. The whiskers are long, eyes rather large, and tail bushy, depressed, ringed black and white. Feet with naked pads, but the rest of the under surface hairy. Claws short, but partially retractile. The animal is about the size of a Cat, being 17$\frac{1}{2}$ inches from the nose to the root of the tail, with the tail 16 inches long, exclusive of the hairs at its tip. It is of a dull brownish yellow mixed with grey (with long black hairs interspersed) above and whitish beneath. The tips of the ears, a spot above and below the eye, and the upper lip are yellowish white. The tail has 7 or 8 brownish-black rings (which become wider antero-posteriorly), with a black tip. It is called the "Cat-Squirrel" by the Texans. It lives amongst rocks and trees. It is not rare, but is seldom seen, being nocturnal. It is easily tamed and even domesticated, and makes a mild and playful pet; it is useful for destroying mice and rats, but is a very destructive animal to poultry, and is naturally bold. The female specimen which was killed is said to have fought furiously with claws and teeth, and shown no disposition to fly. Four or five young adhered to her teats so firmly that it required considerable force to detach them; though when they were removed the mother had been dead several hours, they showed no signs of discomfort. It prefers to inhabit woods traversed by watercourses. It feeds on small quadrupeds and birds, and makes its nest in the trunks of trees, in holes from 12 to 18 inches deep, which are the result of natural decay. It is said, however, always to remove the bark round the mouth of the hole it inhabits, and when no such marks are to be detected, it is a sign that the animal has abandoned that dwelling. The tail is carried bent over the back, much in the fashion of a Squirrel. It has three or four young at a birth.

[1] P. Z. S. 1869, pp. 10 and 33, and fig. 3A.

indeed it is relatively broader than in any Arctoid yet here noticed. It has two external cusps and one internal cusp, and also an external and an internal cingulum, a small extra cusp being developed upon the latter. The second true molar is tricuspid, and also has its transverse diameter in excess. The lower teeth are like those of *Procyon*, only the first inferior molar has its middle external cusp more predominant in height, so giving that tooth a sectorial character.

There is no cæcum, and there is an *os penis* of considerable size.

Bassaricyon[1].—This genus is only known by a skull collected by Prof. Gabb at Costa Rica, described and figured by Mr. J. L. Allen in the Proc. Acad. Phil. as *B. gabbi*, and by a skin and skull of a second species from Ecuador, described and figured by Mr. Oldfield Thomas under the name of *B. alleni*. The external appearance of the first species is quite unknown. That of the second species is, as Mr. Thomas has pointed out, extraordinarily like that of the Kinkajou[2], so that, but for the skull, "no one could have believed that it was anything but a rather small specimen of that animal." The tail, however, does not seem to be prehensile. There are two mammæ placed far back in the abdomen.

The skull is more like that of *Procyon* and *Nasua* than of *Bassaris*. Its general profile is much like that of *Procyon*; but the orbits are very large, and the postorbital processes of the frontal more developed. There are none from the malar. The temporal ridges are widely separated. The palate is flat, extending much behind the last molars, where it is much narrowed; and the bony floor to the orbit (formed by the malar and maxilla) is very large, and the postorbital processes of the frontals are as long almost as those of *Bassaris*.

Molar formula $=$ P. $\frac{4}{4}$, M. $\frac{2}{2}$.

The teeth are not sectorial, the molars being shorter and more nearly square than in either *Nasua* or *Procyon*, though in one species the second upper true molar is subtriangular as in *Procyon*.

A cast of the inside of the skull shows that the brain possesses an Ursine lozenge[3].

Meles[4].—It would be superfluous to say anything here respecting the external characters of this well-known genus[1], comprising its three or four species, all exclusively Palæarctic. As to the skeleton, there are 14 or 15 dorsal, 5 lumbar, 3 sacral, and about 18 caudal vertebræ.

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[1] See Biol. Centr. Am. p. 70; also Allen, Proc. Acad. Phil. 1876, p. 21, pl. i.; and Bull. U. S. Geol. Survey, v. p. 169; also Oldfield Thomas, P. Z. S. 1880, p. 397, pl. xxxviii.

[2] Mr. Thomas says:—"The external resemblance of this species to *Cercoleptes* certainly seems to be an instance of mimicry, which, so common amongst insects, is so rare among Mammalia. It is, however, very difficult to understand how being mistaken for *Cercoleptes* could in any way benefit *Bassaricyon*; but when more of the habits are known, we may be able to guess at the true use of the likeness. Unfortunately no special notice was taken of the animal by the collector, Mr. Buckley, "as both he and the Indians thought it to be merely the common Kinkajou."

[3] See the paper before referred to, p. 13.

[4] See Linn. Syst. Nat. xii. p. 70; Schreber, iii. p. 516, pl. 142; Pallas, Zoograph. i. p. 70; Buffon, vii. p. 104, pls. 7–10; F. Cuv. Mamm. ii. 36 livr.; Wagner, Suppl. ii. p. 180; P. Gervais, Mammifères, ii. p. 101; Bell, Brit. Quad. p. 122; De Blainville, Ostéographie, *Subursus*; Chatin, Ann. des Sc. Nat. (5e série) vol. xix. (1874) p. 106, figs. 65, 66, & 67 (anal glands and caudal pouch).

The dorsal region I have found to be longer relatively than that of any other Carnivore, being most nearly approached by that of *Ictonyx* and *Conepatus*.

To the cranial characters already given by Prof. Flower[2], it may be noted, in addition, that the development of the sagittal ridge very much approaches that of *Ailuropus*. The infraorbital foramen is as large as in *Ailurus*. The postorbital processes are small as always hitherto, except in *Bassaris* and *Bassaricyon*. The palate extends as much behind the molars as in *Procyon*, but is narrower there than in *Nasua*. The pre- and postglenoid processes are so developed as to hold the mandible in their grasp. The frontal sinuses produce a prominence on the cranium; and the ethmoid is much more voluminous than in the previously noted form, and is even more voluminous than in *Canis*, though not so prolonged. The premaxilla does not attain the frontal.

The transverse processes of the lumbar vertebræ are little developed, much as in *Ailurus*; but there are very large hyperapophyses on the laminæ of the cervical vertebræ. The scapula is very nearly a right-angled parallelogram approaching a square. The ridges and condyles of the humerus are much produced, more so than in *Nasua*; and the metacarpals are stouter than in any form yet noticed.

Molar formula $=$ P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The first upper and lower premolar, however, are quite minute and often fall away. The molars differ from those of any Æluroid, Cynoid, or Arctoid yet described in the great preponderance in size of the first upper molars over the fourth premolars, both above and below.

The first two upper premolars are much like the same teeth in *Procyon* and *Nasua*. The fourth is rather more sectorial than in those two genera, because there is only one internal prominence made of two very small internal cusps, with one developed from the internal cingulum as in the third upper premolar of *Ailurus*, only much less developed and distinct, so that they soon wear down into what is apparently the one prominence just spoken of. Of the three external cusps, the middle one greatly preponderates. This tooth has a superficial resemblance to the same tooth in *Paradoxurus*, *Herpestes*, and especially *Bassaris*.

The first upper molar is different from any tooth of any other Carnivore, but most resembles the same tooth of *Ailuropus*. It has two equal-sized external cusps in front, with two small external cusps behind. One large (especially long) internal cusp, obscurely subdivided, with a very large and very distinct internal cingulum, which rises into an obscure cusp at its postero-internal angle.

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[1] I may be permitted to mention that I found the palmar surface naked; but the back of the tarsus was hairy, and naked surface narrow backwards to an acute termination.

[2] P. Z. S, 1869, p. 11.

The second and third inferior premolars are like those of *Procyon* and *Nasua.* The fourth inferior premolar is a more simple tooth, not only than in any Arctoid yet noticed, but than in any Æluroid and Cynoid, except it be a form in which that tooth is merely rudimentary, as *Proteles.* The crown consists of a single cusp, with the most minute indications of rudimentary ones in front and behind, more so behind. The first lower true molar is like the same tooth of *Procyon,* with a semicircular addition to the talon, bearing three tubercles. It is larger relatively than even the corresponding tooth of *Ailuropus.* The second inferior molar, on the other hand, is a small rounded tooth with a rather large external and rather small internal cusp, with a talon which predominates externally, so as to form a sort of second external cusp.

The tongue is rather long and narrow. There are four circumvallate papillæ on either side diverging from a single, more posterior one.

I could find no trace whatever of a lytta.

The anal glands are normal, but, in addition, there is a very noteworthy bilobed gland, which discharges its secretion into a median pouch or sack, situated beneath the root of the tail, and lined with stiff hairs. This subcaudal pouch is no homologue, though it may be an analogue, of the perineal glands so often found in the *Viverridæ.*

The external ear is short and rounded and inconspicuous.

The brain has the anterior limb of the Sylvian gyrus the narrower. The sagittal gyrus, on the contrary, expands very much forwards and is very contorted, and has certain superficial linear depressions on its more posterior part. The anterior part of the cerebrum is very largely developed, the crucial sulcus being placed very far back. There is a very small but very definite Ursine lozenge[1].

Arctonyx[2].—This pig-like Badger genus comprises only one certainly distinct species, which ranges from the north end of Hindostan and Assam and Northern China. It is remarkable for its long snout with a naked mobile termination, which is truncated and perforated by two large terminal nostrils. It is also noteworthy for the combination of a soft under fur, with long bristly hairs interspersed amongst it. The ears are very short and round and flat. The eyes are small. It is carnivorous and nocturnal.

There are 16 dorsal, 4 lumbar, 4 sacral, and 20 caudal vertebræ. It has almost the relatively shortest lumbar region of any Carnivore, the only shorter being those of *Mellivora* and *Crocuta.* It has the relatively shortest metatarsus of any Carnivore, and the longest palate, compared with the length of the cranium, of any Carnivore, except *Procyon.* It has the narrowest brain-case, relatively, of any Arctoid.

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[1] P. Z. S. 1869, p. 14.

[2] See F. Cuvier, Mamm. iii. p. 51; P. Z. S. 1865, p. 137; P. Z. S. 1869, p. 12; Wagner's Suppl. ii. p. 186; Gervais, Mamm. ii. p. 104.

The lumbar vertebræ are found much as in *Meles*. The spinous process of the 13th dorsal vertebra is vertical[1]. The scapula is less quadrate than in *Meles* and more like that of *Procyon*. The fibula is strongly divaricated from the tibia. The proportional length of the ultimate phalanges is nearly the same as in *Meles*.

The skull has the outline of the muzzle, when seen in profile, very like that of *Nasua*, and the lateral posterior portion of the palate shows a trace of the swelling present in the last-named genus. The bony palate is also very prolonged, extending back behind the molars to a line joining the two glenoid surfaces, as it does also in *Procyon* and *Nasua*. In addition to the various cranial characters given by Prof. Flower[2], it may be noted that the sagittal ridge is large, the postorbital processes of the frontal very obscure, and those of the malar wanting. The infraorbital foramen is very large[3] indeed. The pre- and postglenoid processes are smaller and shorter than in *Meles*. The pterygoids descend much as they proceed backwards, are twisted, everted, and somewhat bullate.

The *basis cranii* is more flattened than in any form yet here noted. The mastoid and paroccipital processes form together a continuous ridge on each side of the skull round the region of the bulla, from which the principal process is rather remote. The glenoid foramen is singularly posterior in position with respect to the glenoid surface. The zygomata do not arch much outwards. The angle of the mandible is, as it were, more pushed up close to the condyle than in any form yet noticed, and projects so little as to be almost obsolete. There is no distinct subangular process, but only a roughened tract in the place of it.

Molar formula=P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The first premolar above and below is often rudimentary or absent. The form of the molars is much like that in *Meles*; but the preponderance of the first upper molar over the sectorial is slightly less. The fourth upper premolar is very like that of *Meles*; but it has but a single inner tubercle, and this is smaller than the corresponding part in the tooth of *Meles*. The first upper true molar is quite like what that of *Meles* would be if its anterior internal angle were obliquely cut off. The lower premolars and molars are like those of *Meles*, except that the second true molar is longer in proportion to its breadth.

The canines are more trihedral than hitherto, and the upper incisors are arranged in a more prolonged curve, and the lower ones are more proclivous.

The tongue has two or three circumvallate papillæ on each side of the median line, and narrow as usual. Small papillæ are scattered everywhere, and coat the tongue, which offers no conspicuous character.

The anal glands are normal.

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[1] As also in *Meles*. It is the 12th which is vertebral in *Procyon* and *Cercoleptes*, and the 11th in *Ailurus* and *Bassaris*.

[2] P. Z. S. 1869, p. 12.

[3] It is at its maximum, amongst Carnivores, in this genus and *Lutra*.

Taxidea[1].—The American Badger, or Carcajou, is an indefatigable burrower. It eats Spermophiles, Arvicolas, birds' eggs, and snails, also honeycomb, wax, and bees. The bones and wool of lambs have been found in its burrow. In the north it hibernates from November to April, but does not lose much flesh. It has three or four young at a birth. It is so strong an animal that two men have been unable to pull it out of its burrow by its hind legs. For further details as to its habits, see Coues, 'Fur-bearing Mammals,' p. 285, and also Audubon and Bachman, vol. i. p. 363.

It is remarkable for the enormous claws of its fore paws. The muzzle is furry except at its extremity, which is naked, inclined downwards and backwards, with a median, vertical groove. The nostrils are not visible laterally. The eye is small and high up. The ears are low, rounded, and very broad, with an exceptionally large external aperture protected by long hairs. The palmar and plantar surfaces bear naked pads. It varies much in colour. The short tail has beneath it a subcaudal pouch (as in *Meles*), with a bilobed prominence in front of it. A good account of the habits of the animal will be found in Coues's 'Fur-bearing Mammals,' p. 280. It ranges through western and central North America from N. lat. 58° into Mexico.

There are 15 dorsal, 5 lumbar, 3 sacral, and 14 or more caudal vertebræ. The ultimate phalanges of the digits of the manus are very much longer relatively than those of any other Carnivore, those even of *Suricata* being but little more than half the relative length of those of *Taxidea*. The pelvic limb is but of the same length as the pectoral limb, a condition which only obtains besides in *Mydaus* amongst Carnivores. Only in *Crocuta* is the pectoral limb the longer.

Hence, for the first time in our examination of Arctoids, we find the scapula with the postero-superior angle sharply produced. The metacarpals are still shorter relatively than in *Meles*. There are very large hyperapophyses on the laminæ of the cervical vertebræ.

In addition to the cranial characters described by Prof. Flower[2], we may note that the mastoid and paroccipital processes are much less prominent than in the form last described, the mastoid not descending below the inferior margin of the meatus auditorius externus[3]. The palate is a little less prolonged behind the last molars than in *Meles*, and much less so than in *Arctonyx*. The postglenoid

[1] See Baird, Mam. of N. A. 1857, pp. 202, 745, pl. 39. fig. 2; Gray, P. Z. S. 1865, p. 141; Stev. U. S. Geol. Survey Terr. 1870, 1871, p. 461; Allen, Pr. Boston S. Nat. H. xiii. 1870, p. 183, and Bull. U. S. Geol. and Geogr. Surv. Terr. vol. ii. no. 4, 1875, p. 330; Waterhouse, P. Z. S. 1838, p. 154, and Trans. Z. S. 1841, p. 343, pl. lix.; Buffon, Hist. Nat. Suppl. iii. p. 242, pl. 49; Coues, Fur-bearing Mammals, 1877, p. 261; Wagner's Supp. ii. p. 182; F. Cuv. Mamm. iii. p. 45; Gervais, Mamm. ii. p. 103; Gmelin, Syst. Nat. i. (1788) p. 102. n. 7; Shaw, Gen. Zool. i. 1800; Fischer, Syn. 1829, p. 151; Lesson, Mam. 1827, p. 141. no. 372; Richardson, F. B. A. i. p. 37. no. 12, pl. ii.; Audubon and Bachman, Q. N. A. i. p. 360, pl. 47.

[2] P. Z. S. 1869, p. 11.

[3] It does not so descend in *Ailurus* and *Bassaris*.

process is not so long as in *Meles*, and the zygomata are not so arched outwards; the skull has no such produced sagittal ridge, but is more flattened and much more broadened out posteriorly, like that of some aquatic forms. The muzzle is also shorter. The malar develops a distinct postorbital process, and that of the frontal is at least as marked. The infraorbital process is still very large. There is no subangular process.

Molar formula, P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The upper incisors stand almost on a straight line, so slight is the curvature of their range. The first upper premolar seems to be always absent very early, and the first lower are generally so. The first upper molar, instead of greatly preponderating over the fourth upper premolar, is of about the same size. Compared with the teeth of *Meles*, the third upper premolar is larger, and the first molar smaller. The fourth upper premolar is, like that of *Meles*, more quadrate and developed, with the anterior and posterior external cusps larger, the antero-internal cusp much more developed, but no internal cingulum. The first true molar has its postero-external angle atrophied (compared with that of *Meles*), while it develops inwards somewhat posteriorly. It has the same essential pattern on its grinding surface, but the cusps are reduced so as to form as it were only a crumpled superficial irregularity, something like that of the third upper true molar of *Ailuropus*, with its postero-external angle obliquely cut away. There is really both a small external and a large internal cingulum, and also two minute external cusps (within the external cingulum), an internal cusp (enclosed by the internal cingulum), and the median prominence of *Meles*, here subdivided into two prominences, one in front of the other.

In the lower jaw, the second and third premolars are as in *Meles*. The fourth is peculiar, and consists of three cusps, whereof the first and second are very light, and form a sectorial blade to fit against the front part of the fourth upper premolar. Behind these is a small, low cusp. The first molar is very like the corresponding tooth of the Civet, but the antero-external cusp is higher, and the talon larger, supporting five minute tubercles. The anterior sectorial part bites against the hinder part of the fourth upper premolar. The second molar is small, rounded, and quadricuspidate.

The bone of the penis is four inches long; one end of it has the form of a club, the other is bent at right angles to the shaft of the bone, and is flattened and grooved.

Mydaus[1].—The Teledu, a small burrowing Badger, of Java and Sumatra, is found at an elevation of 7000 feet or more, and is but about one third of the size of the Common Badger. There is but one true species of the genus. It has an elongated movable snout, obliquely truncated terminally, with inferior nostrils. There is not only a median nasal groove, but there is also a vertical groove on either side of it. Tail very short, but clothed with long hairs. Ears with quite a rudimentary pinna; a small vertical fold behind the meatus.

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[1] See Horsfield, Zool. Research. n. 2; F. Cuvier, Mamm. ii. p. 27, and iii. p. 51; Desmarest, Mamm. p. 187; Raffles, Linn. Trans. xiii. p. 251; Gray, M. Zool. i. tab. 6 & 7; Wagner's Supp. ii. p. 184; Gervais, Mammifères, ii. p. 105.

The palms and soles are naked. The claws are much longer on the manus than on the pes; the former are very long, but not quite so long relatively as in *Taxidea*.

There are 14 or 15 dorsal, 6 or 5 lumbar, 3 sacral, and 12 caudal vertebræ. As to the relative proportion of parts with body, the humerus is larger than in any other Carnivore, the next longest being that of *Ailurus*. The tail is shorter than that of *Arctonyx*. The skull is nearly relatively as long as that of *Nasua*. As in *Taxidea*, the pectoral and pelvic limbs are of equal length. The transverse processes of the lumbar vertebræ are very short. The 12th dorsal vertebra has its spine vertical. The scapula has its postero-superior angle somewhat pronounced. The metacromion is very small, but a similarly directed process extends backwards from higher up the spine to the scapula, as if the metacromion process had slipped up. The humerus, however, has an olecranal as well as a condyloid perforation. Both the pollux and hallux are very well developed.

In addition to the cranial characters already described by Prof. Flower[1], it may be noted that the palate has laterally a certain swollen appearance, reminding us of *Nasua*. The mastoid is much swollen, but does not depend below the meatus auditorius externus. As in *Arctonyx* so here, the paroccipital process is remote from the bulla. As in *Arctonyx*, again, the muzzle has a *Nasua*-like aspect when seen in profile. The supraorbital is relatively, as well as absolutely, smaller. Altogether the skull is *Arctonyx*-like, because, though the bullæ are more bullate, yet they are but slightly bullate considering the small size of the animal. The zygomata are weaker relatively than in *Arctonyx*. The meatus auditorius externus is very large relatively. As in *Arctonyx*, there is no malar postorbital process; and the postorbital process from the frontal is still more blunt than it is in that genus. As in *Arctonyx*, the glenoid foramen is much posterior to the glenoid surface.

The mandible has a larger and more oblique symphysis than in any form yet described. It is larger even than in *Eupleres*, and the two rami have anchylosed together. Moreover the symphysis is not only long, but also broad and conspicuous. The angle is pushed up, as in *Arctonyx*, with a strongly everted margin running down from it to the place of the subangular process, and seeming to represent a toughened tract which exists in *Arctonyx*.

Molar formula = P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The incisors are exceptionally broad relatively. The grinders are formed quite on the *Arctonyx* type, though their cusps are generally more acute, and the first upper true molar is relatively smaller and less complex in that it has the internal cingulum reduced. The lower grinders are like those of *Arctonyx*.

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[1] P. Z. S. 1869, p. 12.

The anal glands are large and their secretion approximates in offensiveness to that of the Skunks.

Mephitis[1].—In this genus the muzzle is pointed, the nostrils lateral, the feet narrow, with the palmar surfaces naked, the plantar surfaces partially hairy, and a long and bushy tail. There are several, probably three, species, all either North or Central American (ranging from Hudson's Bay and the Great Bear Lake to Guatemala) and extraordinarily variable not only in the markings of the long loose fur and in the degree of hairiness of the soles, but in the form of the cranium also. Yet the coloration is very consistent; black and white, the normal arrangement of which is—general colour black with white markings and for the most part more or less longitudinally disposed. The Skunks are terrestrial and more or less fossorial, with strong claws to the fore paws; progression is semiplantigrade, and slow, and the general form of the body stout and rather low. There is no subcaudal pouch, but the anal glands are extraordinarily developed, invested by a muscular tunic, and their contents can be ejected a distance of fourteen feet, the tail being held erect and the anus everted. It does not ordinarily smell and may be eaten. The Skunk is more or less thoroughly nocturnal and is easily trapped. Its fur goes by the name of "Alaska sable." It does not become rare in settled districts[2], and is very prolific, bringing forth 8 or 10 young. It is more gregarious than most creatures of the weasel kind (*Mustelidæ*), more than one family congregating in one burrow. It eats worms, insects, birds' eggs, frogs, and mice, and sometimes rabbits, as also roots and berries; it occasionally robs the poultry-yard, and is said to be fond of milk. It falls a prey to dogs and the Great Horned Owl. Its bite sometimes produces hydrophobia; it can be readily semidomesticated like a ferret, and it is said sometimes to have had its anal glands successfully removed.

The eye is small, nearer to the nose than to the ear; ears short and rounded.

It has 16 dorsal, 6 lumbar, 2 sacral, and 21 caudal vertebræ. The third phalanx of the third digit of the manus is relatively longer than in any other Carnivore except *Taxidea*. The length of the palate compared with that of the skull is less than that of any other Arctoid except *Putorius*.

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[1] Shaw, G. Zool. i. (1800) p. 390, pl. 94; Gmelin, Linn. xiii. 1, p. 88; Humboldt, Obs. de Zool. p. 350; Buffon, xiii. p. 287, pl. 39; and Suppl. vii. p. 233, pl. 57; F. Cuv. Mamm.; Stev. U. S. Geol. Surv. for 1870, 1871, p. 461; Parker, Am. Nat. v. 1871, p. 246; Coues, Bull. U. S. Geol. & Geogr. Surv. Terr. 2nd series, no. 1 (1875), and Fur-bearing Animals, p. 187; Allen, Bull. U. S. Geol. Survey, vol. ii. no. 4. 1876, p. 332; Licht. Darstell. Säug. 1827-34, pl. 45, and Abh. Akad. Wiss. Berl. 1836-38, p. 280; Maximilian, Reise N. A. i. 1839, p. 250; Arch. f. Naturg. 1861; Wagner, Supp. ii. p. 198; Aud. & Bach. Q. N. A. i. 1849, pl. 42; Richardson, Zool. Beechey's Voy. 1839, p. 4; Wyman, Pr. Boston Soc. 1844, p. 110; Warren, Pr. Boston Soc. 1849, p. 175; Baird, N. Am. Mamm. p. 193; P. Gervais, Mamm. ii. p. 106; Biologia, p. 80.

[2] Being so much protected by its secretion, which enables it to live without being able to run fast, climb trees, swim, or even burrow with great rapidity.

The lumbar transverse processes are very small indeed, and the humerus has no intercondyloid canal.

The more important cranial characters have been described by Prof. Flower[1]. It may here be noted in addition that the mastoid process does not descend below the meatus auditorius externus, but a ridge continues on from it to the paroccipital process and tends to form a wall around a depressed surface as in *Arctonyx*. There is a peculiar and marked bony canal which is posterior and internal to the conspicuous carotid foramen extending from within the latter backwards towards the foramen lacerum posterius. The palate does not extend back beyond, or hardly beyond, the last molars. The bulla develops an anteriorly extending pointed process, which approximates to, but does not join, the pterygoid. The zygomata arch rather strongly outwards, but do not develop a postorbital process, and there is hardly any such process from the frontal. The muzzle is short and there is a sagittal ridge. The infraorbital foramen is rather or very small and may be double or triple; the palate hardly extends back beyond the last molars. The angle of the mandible is rather marked and is not pressed towards the condyle.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The fourth upper premolar is rather sectorial and much like that of the Civet and of *Grisonia*, but the internal and postero-external cusps are rather smaller than in the latter. The first true molar is large and nearly square, a little broader than long, on the type of that of *Meles*. The two cusps of the external cingulum blend with the two principal external cusps, and there are two internal cusps and an internal cingulum. The first inferior true molar has one anterior cusp, behind which are two cusps, one external, the other internal, of about equal size, followed by a talon with two or three cusps, but which does not form half of the tooth. The second inferior true molar has a rather triangular grinding surface, with three tubercles developed as it were on a ridge surrounding a central depression.

Conepatus[2].—This more southern form extends from the south-western United States and Texas through all Central and South America. It has no median groove on nose or upper lip. The external ears are very little developed. The snout is truncated, the nostrils opening forwards, not downwards. The feet are broad, with wholly naked soles. The tail is shorter and more closely haired than in *Mephitis*. It is very variable in colour.

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[1] P. Z. S. 1869, p. 11.

[2] See Gmelin, Syst. Nat. i. (1788) p. 88. no. 15; Shaw, Gen. Zool. (1800) p. 392; Humboldt, Rec. Obs. Zool. i. p. 350; Lesson, Mam. (1827) p. 151, n. 407; Fischer, Syn. (1829) p. 161; Licht. Abh. Ak. W. Berlin (1837), p. 270; Tschudi, F. Peruana (1844–6), p. 113; Baird, N. A. Mam. p. 192, and Report U. S. B. S. ii. Mam. p. 19; Tomes, P. Z. S. 1861, p. 280; Audubon and Bachman, Q. N. A. ii. (1851) p. 18, pl. 53; Bennett, P. Z. S. 1833, p. 39; Gray, Cat. Carn. Brit. Mus. p. 134; Coues, Fur-bearing An. p. 249; Biologia, p. 84; De Saussure, Rev. et Mag. de Zool. 1860, xii. p. 6; Frantzius, Arch. f. Natur. xxxv. 1, p. 289; Chatin, Ann. Sc. Nat. 5^{e} série, xix. (1874) p. 100, pl. 6. figs. 59–63, showing aspect of anus and extraordinarily large anal glands. Audubon remarks that this animal "is found in the brown, broomy, sedgy plains, as well as in the woods and cultivated districts of Texas and Mexico," and that it "eats grubs and insects, small beasts and birds' eggs, and all it can." It "dwells in burrows and the roots of trees, or in fallen trunks, or in cavities under rocks. It is easily caught going to its burrow and there remaining till worried out. It is nocturnal and a destroyer of poultry."

There are 16 dorsal, 4 lumbar, 3 sacral, and 18 caudal vertebræ. The pelvic limb is longer compared with the spine than in any other Arctoid except *Procyon* and some Bears. The first lower true molar is longer compared with the length of the skull than in any other Arctoid.

In the form of the skull and teeth *Conepatus* closely resembles *Mephitis*. The auditory bulla is rounded, apparently undivided internally, and most prominent towards the centre of the basis cranii. The foramen condyloideum is conspicuous, but is placed far forwards and close to the large foramen lacerum posterius. There is a conspicuous carotid foramen, just behind the middle of the inner margin of the bulla. The glenoid foramen is just above the auditory meatus, which inclines forwards. There is a rather marked paroccipital process, which is quite away from the bulla and prominent mastoid process, the latter depending quite to the level of the floor of the meatus, if not below it. No ridge quite connects the paroccipital and mastoid processes. The zygoma is delicate and weak, and bears no postorbital process, while that of the frontal is only a slight rounded prominence. The cranium is long and the muzzle short. Sagittal ridge present or absent. There is a moderate single or supraorbital foramen or two small foramina. The posterior palatine foramina are placed in the front half of the palate. The palate is broad and flat, and extends decidedly, though not much, backwards behind the hinder molars. The angle of the mandible is marked and is not pressed upwards. The canines are very small.

Molar formula = P. $\frac{2}{3}$, M. $\frac{1}{2}$.

The third upper premolar is small and triangular. The fourth has a large middle and posterior outer cusp, and a very small anterior outer cusp and a large internal cusp. The functional surface of the tooth is triangular, broader behind than in front. The first upper molar is large and quadrate, with a surface formed on the type of that of the Badger. There appear to be four principal cusps, whereof the two posterior are the smaller. There are also one or two small cusps on the external cingulum, and there is a well-developed ridge-like internal cingulum. It is larger compared with the fourth premolar than in *Mephitis*. The second inferior premolar is very small. The third and fourth have each one considerable median cusp with a small cusp on either side of it. The first inferior molar has a single front cusp, followed by two, one internal and one external. Behind them is a talon, which constitutes half the tooth or even more. The second inferior true molar is small and rounded.

Mellivora[1].—The genus *Mellivora* is the first genus of Arctoids which is common to Asia and Africa, one species being found in Western and Southern Africa and another in India. Badger-like in figure, with stout body, short limbs, and plantigrade extremities, they have also a short tail, and external ears so small as to be rudimentary. The pinna has indeed no free edge, but an obtuse thick hinder margin, whence the transverse ridges proceed inwards. There is no distinct tragus or antitragus. There is a rather pointed muzzle.

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[1] See Shaw Zool. i. p. 470 (1800); Fischer, Syn. Mam. p. 151; Hardwick, Linn. Trans. ix. p. 115, pl. 9; Bennett, Zool. Gard. p. 13; De Blainville, Ostéologie, *Mustela*; Desm. Mam. p. 176; Schreber. Säug. p. 450, pl. 135; Sunde-

The palmar and plantar surfaces are naked. In their peculiar coloration (grey above, black below) they afford an instance of that tendency to longitudinal markings which appears again and again in Arctoid genera.

There are 14 dorsal, 4 or 5 lumbar, 4 or 3 sacral, and 15 or 16 caudal vertebræ. Here the cervical region attains its greatest relative length in any Arctoid, while the lumbar region is shorter than in any except *Melursus*; and the fore and hind limbs are more equal in length than in any others except *Taxidea* and *Mydaus*.

All the neural spines of the vertebræ, from the 15th to the 4th sacral inclusive, are vertical. The lumbar transverse processes are very small. The humerus has a large olecranal perforation, but sometimes the internal condyloid canal is absent. Sir Richard Owen says that there is no medullary cavity in the tibia[1].

The cranial characters have been described by Professor Flower[2]; but it may be further noted that the paroccipital and mastoid processes do not make a continuous ridge or wall. The latter process hardly depends below the external meatus. The aspect of the skull is very like that of *Meles*, but the forehead is more rounded transversely, and the sagittal ridge is much smaller, though the zygomata are not so strongly arched and the infraorbital foramen is much smaller.

The angle of the mandible is less conspicuous than in *Meles*, hardly more so than in *Arctonyx*. The margin of the mandible below it is roughened and somewhat everted, so as to form a sort of slightly defined subangular process. The palate is less prolonged and its hinder part is bounded laterally by a very strong plate-like ridge, which continues on to the hamular processes of the pterygoids, which descend below the level of the palate in a very exceptional manner. There is no malar postorbital process, and that of the frontal is very blunt.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{1}$.

The third upper premolar is like that of the Civet, except that the posterior cusp is more developed. The fourth premolar has the external cusps (whereof the anterior is the larger) and a large internal cusp, as in the Civet, opposite the principal external one. The first upper molar is a short but wide tooth, considerably wider

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vall, Kong. Vet. Akad. Handl. 1841, p. 211; Sclater, P. Z. S. 1867, p. 98, pl. 8; Wagner, Supp. ii. p. 207; Sparrmann in K. Vetensk. Acad. Handl. (1777) p. 49, pl. 4; P. Gervais, Mamm. ii. p. 109.

[1] P. Z. S. 1869, p. 12.

[2] Anat. of Vertebrates, vol. ii. p. 509.

within than without. There are two minute external cusps, a considerably larger internal cusp, and an internal cingulum.

The fourth inferior premolar is much like that of *Hyæna*, but with two minute cusps in front of and two behind the large single median cusp. The first lower true molar is sectorial, a good deal like that of the Civets, but with no internal cusp and but a very small talon.

The brain[1] presents a long oblique Sylvian fissure and a Sylvian gyrus, the anterior limb of which is exceedingly narrow. The sagittal gyrus expands very much anteriorly. There is an Ursine lozenge of a rather elongated shape.

Helictis[2].—This genus contains four species of small more or less arboreal Arctoids from Eastern Asia. The body is elongated and the limbs short, the tail being either short or of moderate length and bushy. The ears are small. The snout is elongated, obliquely truncated, and naked at the tip, which bears a distinct nasal groove, which extends down the upper lip. The palmar surfaces are naked, but the plantar surfaces are clothed with hair on the hinder half; yet the habit is said to be plantigrade.

There are 14 dorsal, 6 lumbar, 3 sacral, and 18 caudal vertebræ.

The cranial characters other than those given by Professor Flower[3] are that the skull has a rather long muzzle, somewhat like that of *Nasua*. The occiput shows a marked cerebellar prominence. There are marked postorbital processes from the frontals, but hardly any from the malar bones. The zygomata do not arch strongly outwards. The mastoid process does not descend quite to the level of the floor of the meatus auditorius externus. The palate extends back but little behind the last molars. There is a large infraorbital foramen. The angle of the mandible is formed as in *Meles*.

Molar formula $= \text{P.}\ \frac{4}{4},\ \text{M.}\ \frac{1}{2}$.

The fourth upper premolar is quite like that of *Taxidea*[4]. The first upper true molar diverges from the form met with in the Badger group (i. e. *Meles*, *Taxidea*, *Arctonyx*, and *Mydaus*), and approaches that found in *Procyon*. It is like the first upper true molar of *Procyon*, with the postero-external and postero-internal cusps (especially the latter) reduced in size and with an enlarged internal cingulum. There is also a distinct external cingulum, which tends to develop two small cusps just outside the two external principal cusps. The fourth lower premolar has one principal cusp with a minute accessory cusp in front of it and two larger ones behind it. The first lower true molar has two external cusps, the hinder one of which slightly predominates. There is also a large internal cusp as well as also a well-developed talon, which may be minutely tricuspid. The second lower true molar is a small rounded tooth, the grinding surface of which presents a median depression surrounded by a low wall.

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[1] See *l. c.* p. 14, figs. 2 and 3.

[2] See Is. Geoff. Voy. de Bélang. Zool. p. 129, pl. 5; Guérin, Mag. Zool. 1835, vol. i. pl. 14; Horsfield, Zool. Research.; Desm. Mamm. p. 537; Cuv. Rech. iv. p. 474; Temminck's Monograph, i. p. xx; Hodgson, Journ. Asiatic Soc. of Bengal, v. p. 237, vi. 2, p. 560; Wagner, Supp. ii. p. 201; P. Gervais, Mamm. ii. p. 105; Gray, Pr. Zool. Soc. 1833, p. 94, 1853, p. 191, 1865, p. 152; Cat. Carnivora Brit. Mus. p. 141; De Blainville, Ostéographie, *Mustela*.

[3] P. Z. S. 1869, p. 12.

[4] See above, p. 278.

The brain[1] (which has been described and figured by the late Professor Garrod) presents the peculiarity of the hippocampal gyrus rising to the surface on either side of the great longitudinal fissure, and so making its very distinct Ursine lozenge incomplete behind. The callous marginal and crucial sulci unite, as also do the parietal and sagittal gyri at the posterior upper angle of the cerebrum.

Ictonyx[2].—In colour and markings, as well as in the odour of the secretion of its anal glands, the one or two species which form this genus resemble the Skunks; so much so, that did they inhabit the same region, and were they devoid of an offensive secretion, they would certainly be said to mimic the Skunks. They differ greatly from the Skunks, however, in the form of the teeth, in which they approximate to the Weasels.

The head is conical, with a pointed nose, marked at the tip with a median groove. The ears are rounded and hairy. The claws are long and pointed and not retractile. The hind foot is digitigrade, with the hinder part of the sole hairy. The tail is long and covered with long hair. The body is elongated, the lines short.

There are 15 dorsal, 5 lumbar, 2 sacral, and 23 caudal vertebræ. The dorsal region is almost the longest relatively, and the sacral region is the shortest of any Arctoid. The third phalanx of the third digit of the pes is also at its maximum of relative length, as is the breadth of the brain-case, the length of the lower molar series, and the length of the fourth upper premolar, the length of the spine being the standard of comparison.

The cranium has the characters mentioned by Prof. Flower[3], as also the following ones. The frontal postorbital processes are marked, but there are none from the malars. The zygomata do not arch strongly outwards. The size of the infraorbital foramen is moderate. The palate extends back but little behind the last molars. The mastoid processes are rather prominent, but do not descend to the level of the floor of the meatus auditorius externus. The stylo-mastoid foramina are very conspicuous, and the opening of the external auditory meatus is very large. The angle of the mandible resembles in form that of *Meles*.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The general form of the teeth is that which exists in *Mustela*[4], but the first upper true molar is larger, and it is much wider than long and has five cusps. Two of these are the two external principal cusps, outside which is a single cusp developed from the external cingulum. Two other cusps are developed from the internal cingulum. The fourth lower premolar has one principal cusp, with a very small one in front of it and two large ones behind it. The first lower true molar has two external cusps in front; the hinder one predominates greatly. There is also an internal cusp (less developed than in *Helictis*), and a distinct talon with three small cusps. The second lower true molar has three small external cusps and one large internal cusp.

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[1] See *l. c.* p. 18 and P. Z. S. 1879, p. 307, figs. 1 and 2.

[2] Or *Zorilla*. See Schreber, iii. p. 445, pl. 123; Buffon, xiii. p. 289, pl. 41; Lichtenst. Berlin Abh. 1838, p. 281, pl. 2; Gray, Lond. Mag. i. p. 581; P. Z. S. 1865, p. 151, Cat. of Carniv. Brit. Mus. p. 139; De Blainville, Ostéogr. *Mustela*; Wagner, Suppl. ii. pp. 199 and (*Rhabdogale*) 219; P. Gervais, Mamm. ii. p. 115.

[3] P. Z. S. 1869, p. 13, *Rhabdogale*.

[4] See below, p. 378.

The brain[1] has a long, oblique, Sylvian fissure; the Sylvian gyrus is much narrower in front than behind. The parietal gyrus is simple. The sagittal gyrus is wide, especially towards its anterior end. There is a distinct but small Ursine lozenge and calloso-marginal and crucial sulci join. The parietal and sagittal gyri unite posteriorly, as they do in *Helictis*.

Galictis[2].—The Tayra has the digits closely connected, the soles naked, and the gait almost plantigrade. The nose has a median groove. The ears are short and rounded. The pupils are round. The concha is small and flat, with a very shallow pouch, and then superimposed transverse ridges. The Tayra ranges from the Rio de la Plata northwards to Mexico. It is more or less gregarious, that is to say it has been observed in troops of from 15 to 20 individuals sometimes, at least in British Honduras.

There are 14 dorsal, 6 lumbar, 3 sacral, and 23 caudal vertebræ. The neck is relatively long, longer than in almost all other Arctoids. The first and second lower true molars are at almost their minimum length amongst Arctoids, compared with the length of the skull.

The scapula has a very distinct and well-developed metacromion. Both hallux and pollex are fairly developed.

The skull has a sagittal ridge and its zygomata are rather strongly arched outwards. The bulla is like that of *Meles*, with its ridge more rounded. The glenoid foramen is large and opposite the middle of the postglenoid process. The paroccipital process is but little prominent and is applied to the back of the bulla. The mastoid process is rounded, so as to be little conspicuous. It does not depend below the meatus. The muzzle is short. There are frontal sinuses. The palate is wide and extends backwards beyond the last molars much as it does in *Meles*. There is a small postorbital process developed from the malar and a pretty good one from the frontal. The infraorbital foramen is moderate. The meatus auditorius externus is short and of moderate capacity. The angle of the mandible is pressed up very near to the condyle, and the margin below it is much flattened and everted. The angle is, however, more conspicuous than in *Arctonyx* or *Mydaus*.

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[1] *L. c.* p. 18.

[2] See Linn. Syst. Nat. (1766) i. p. 67; Schreb. iii. p. 493; Desm. Mamm. p. 175 *; Rengger's Paraguay, p. 119; Traill, Mem. of the Werner. Soc. iii. p. 440, pl. 23. Tayra, Buffon, Suppl. vii. p. 250, pl. 60; Azar. Ess. i. p. 197; Fr. Cuv. Mamm. iii.; Wagner, Suppl. ii. p. 214; Biologia, p. 79; Bell, Zool. Journ. ii. (1826) p. 552; Frantzius, Arch. f. Naturg. xxxv. 1, p. 287; Moore, P. Z. S. 1859, p. 51; P. Gervais, Mamm. ii. p. 110; Gray, P. Z. S. 1865, p. 121; De Blainville, Ostéog. *Mustela*; Cat. Carnivora Brit. Mus. p. 99; Tschudi, Fauna Peruana & Arch. 1844, p. 248; Hernandez, vol. vii. cap. 21, the Tapeytzcuitli.

Molar formula=P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The fourth upper premolar is formed like that of the Civet. The first upper true molar is very short but wide, more like that of *Hyæna* than is the same tooth in any Arctoid yet here noticed. It is, however, relatively wider within than without inwards. There are two minute external tubercles and a yet smaller internal one, within which is a large internal cingulum. The three inferior premolars are much as in *Meles*. The first lower true molar is very sectorial, and not quite like any tooth as yet here described. It is a good deal like that of the Civet, with the talon reduced, or like the front half of the same tooth in *Meles*, with only a very small talon instead of the large one of the Badger. The most anterior cusp is narrower than the one behind it, and their adjacent margins form together an acute angle. The second true lower molar is a small rounded tooth. The liver is very like that of *Nasua*, but the part of the right central lobe which is on the left of the gall-bladder is large.

The brain[1] is very complicated in its dorsal convolutions. The Sylvian fissure is long and oblique and the anterior limb of the Sylvian gyrus is very decidedly the narrower. There is a small Ursine lozenge. The crucial and calloso-marginal sulci do not join, a bridging convolution connecting the hippocampal and sagittal gyri behind the crucial sulcus.

Grisonia[2].—The Grison has a tail about half the length of its slender body. The nose is destitute of any median groove and the muzzle is rather acute. The eyes are short, broad, and rounded; the legs are short. The soles are naked, and locomotion is semiplantigrade.

It inhabits Tropical and South America.

There are 16 dorsal, 5 lumbar, 3 sacral, and 21 cervical vertebræ. It has the relatively shortest Arctoid radius except *Lutra*. Compared with the length of the head it has the broadest palate of any Arctoid.

The only cranial differences from *Galictis* I observed were that the foramen glenoideum is very small, instead of large, and that the meatus auditorius externus is both long and very wide.

The first cusp of the first lower molar is wide, and quite as wide as the second, and their adjacent edges form an obtuse angle.

The liver is like that of *Galictis*, but the left central lobe is smaller, and the right central lobe is uniform in its diaphragmatic aspect.

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[1] See *l. c.* pp. 15 & 16, figs. 4 & 5.

[2] See Schreber, Säug. p. 447, pl. 124; Thunberg, Mém. Acad. St. Pétersb. vi. p. 401, pl. 13; Traill, Mem. Wern. Soc. iii. p. 437, pl. 19; Desmarest, Mam. p. 175; Molina, Chile, iv. p. 258; Shaw, Gen. Zool. i. p. 433; Bell, Trans. Zool. Soc. ii. p. 204, pl. 37; Buffon, H. N. Supp. iii. p. 170, pl. 25; Martin, P. Z. S. 1833, p. 140; Gray, P. Z. S. 1865, p. 122, Cat. Carniv. B. Mus. p. 99; De Blainville, Ostéog. *Mustela*; Waterhouse, Zool. of 'Beagle,' i. p. 21; Wagner, Supp. ii. p. 215; P. Gervais, Mamm. ii. p. 110; Azara, Ess. i. p. 190.

The tongue has rather small but very marked pyriform papillæ scattered all over its surface. The flattened papillæ are considerably elongated and rather conspicuous. The circumvallate papillæ form a **V** with three fine papillæ in either limb and one at the apex.

The brain[1] is very different from that of *Galictis*, in that its hippocampal gyrus is cut off from the sagittal gyrus by the junction of the calloso-marginal and crucial sulci. There is a more or less well-defined Ursine lozenge.

Mustela[2].—The Martens, or Stouter Weasels with normally four premolars on each side, both above and below, present us with the first Arctoid genus, but not species, common to the Old and New Worlds. Of the nine or ten species which appear to compose it, some are common to Europe and Asia, but none to the Palæarctic and Nearctic, or to the Palæarctic and Oriental regions, though the *M. flavigula* extends from Northern Hindostan to Java, Sumatra, and Borneo. No species is Neotropical. The American Pekan[3], *M. pennanti*, is the giant of the genus, which may be 30 inches from snout to tail-root, with the tail 16 inches long.

The body is long, the limbs short and digitigrade, the pectoral limb being about 54, and the pelvic limb 69, to the spine taken at 100.

The ears are low, broad, and hairy on both sides. There is a distinct pouch, a moderate tragus and antitragus, a small helix, a very prominent supratragus overhanging a fossa bounded beneath by a rather marked transverse ridge and surmounted by another fossa, bounded above by a rounded transverse ridge. The nose has a median vertical groove.

The soles and palms are generally hairy. In some forms, as in the Sable, they are extremely furry, but sometimes in southern species the palms and soles are naked[4].

There are 14 dorsal, 6 lumbar, 3 sacral, and from 18–23 caudal vertebræ.

The metatarsals are at their maximum of relative length amongst Arctoids, while the length of the skull may be at its minimum (14·5 to 100) as also the length and breadth of the palate, width of the zygomata, the brain-case, the breadth behind the orbits, the length of the first upper true molar and of the second lower true molar, all compared with the length of the spine from the atlas to the end of the sacrum.

Here the neural spine of the eleventh dorsal vertebra inclines forwards. The scapula has a large metacromion process.

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[1] See *l. c.* pp. 16 & 17, figs. 6 & 7.

[2] *Mustela*, Linnæus, Wagner, P. Gervais, and others; *Martes*, Gesner, Ray, Bell, Gray, Fitzinger, &c. For synonymy see Coues, 'Fur-bearing Animals,' pp. 59, 62, 74, 77, 79, 81, 97, &c.

[3] Pekan, Buffon, H. Nat. xiii. p. 304, pl. 42; Audubon & Bachman, Q. N. A. i. 307, pl. 41; the European and American Sables (*M. zibellina* and *M. americana*) belong to this genus; the Weasels, Ermines, Stoats, Ferrets, Polecats. Minks, and Vison, to *Putorius*.

[4] I am indebted to Mr. Oldfield Thomas for calling my attention to this fact.

To the cranial characters mentioned by Prof. Flower[1] may be added the small length of the muzzle compared with the great length of the cranium proper. The infraorbital foramen is rather large, the zygomata delicate but well arched outwards, and the palate is prolonged backwards behind the last molars.

The angle of the mandible, though much pressed upwards, is still distinctly distinguishable.

Molar formula $=$ P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The dentition is more sectorial than heretofore. The second upper and lower premolars are two-rooted. The fourth upper premolar has a very small hinder lobe, and no lobe in front of the principal lobe, so that the tooth is very like the corresponding one of *Canis*, especially as the internal lobe is anterior in position, opposite the front part of the principal cusp.

Of the lower teeth, the front premolar is like that of *Galictis*. The first molar like that of *Mellivora*, but larger and especially lower, while the second molar is a small rounded tooth.

The brain[2] shows a distinct but small Ursine lozenge in front of a considerable crucial sulcus which is placed rather far back. The sagittal gyrus is much the widest of the three circumsylvian gyri. The crucial and calloso-marginal sulci run one into the other. The Sylvian fissure is oblique and relatively long.

Putorius[3].—This very large genus of small-sized mammals is very wide spread, inhabiting as it does not only the Nearctic and Palæarctic regions and the Indian Archipelago, but also Africa, north and south, and South America, including Brazil. There may be something like two dozen species. The body attains its maximum of length and the limbs their minimum. Here for the first time we meet with species (*P. vulgaris* and *P. erminea*) common to the old and new worlds. The feet are more or less hairy beneath, especially the hinder part of tarsus. Habit digitigrade. The nose bears a median vertical groove.

The Mink (*P. vison*) is aquatic in its habits.

There may be from 13 to 16 dorsal and 5 or 6 lumbar, the dorsal and lumbar vertebræ together varying from 19 to 21.

The lumbar region is at its maximum of relative length amongst Arctoids, and the dorsal region almost at its minimum. The limbs are at their minimum length as compared with the spine, as are also the femur, tibia, and metacarpus. The length of the palate, and the breadth of the zygomata, compared with the length of the skull, are also at their minimum.

The infraorbital foramen is larger relatively than in *Mustela*, and the mastoid and paroccipital processes are still more indistinct[4].

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[1] P. Z. S. 1869, p. 39, *Martes*.

[2] *L. c.* p. 17.

[3] This is *Mustela* of Aldrovandus, Ray, Klein, Schreber, Gmelin, Desmarest, Lesson, Fischer, Bell, Gray, and Coues, see 'Fur-bearing Animals,' p. 102. It also includes the *Gale*, *Gymnopus*, *Lutreola*, *Neogale*, and *Vison* of Gray. It is the *Putorius* of Cuvier, Brandt, Gray, Richardson, Audubon and Bachman, Coues, P. Gervais, and others.

[4] For other cranial characters see Flower, P. Z. S. 1869, p. 13 & fig. 4.

The angle of the mandible is hardly more marked than in *Arctonyx*.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The cusps are somewhat sharper than in *Mustela*. The upper sectorial has its inner cusps less anteriorly placed and the lower sectorial has its inner cusp more rudimentary.

The brain[1], though very little convoluted, as is the rule in the smallest mammals of each group, shows a distinct, though minute, Ursine lozenge. The crucial and calloso-marginal sulci run into one another. The sulcus separating the sagittal and parietal gyri is less produced posteriorly than in other Carnivora. The Sylvian fissure is oblique and relatively long.

Pœcilogale.—This small South-African genus, coloured like the Zorilla, has been founded by Mr. O. Thomas[2] on the *Mustela albinucha* of Gray[3]. Its molar formula: P. $\frac{2}{2}$, M. $\frac{1}{1}$, rarely $\frac{1}{2}$. It has the smaller number in all the British Museum specimens examined by Mr. Thomas, but the second minute lower true molar is present in the specimens in the Paris Museum. The auditory bullæ are perfectly flattened.

Lyncodon[4].—This and the last genus are the Arctoids with the smallest number of teeth and most feline dentition, whence the name of this genus. The animal comes from Patagonia. Mr. O. Thomas considers that it may merely be an aberrant southern form of *Putorius brasiliensis*. Its skull is quite like that of *Putorius*, but the bullæ are unusually inflated.

Molar formula = P. $\frac{2}{2}$, M. $\frac{1}{1}$.

Its external form has been unknown till recently. C. Vogt describes as follows skins from Patagonia preserved in the Museum of Geneva :—" L'animal est une vraie belette un peu plus grande que l'hermine. Le corps a 30 cent. de long, la queue 9 cent. La fourrure est rude, grossière, formée de longs poils clairsemés d'un brun rouge clair avec des pointes blanchâtres sur le dos, les flancs et la queue. Le dessus de la tête est d'un blanc jaunâtre sale, et cette teinte se continue en arrière des deux côtes par-dessus les oreilles en deux pinceaux-pointus, formés de poils très longs couchés sur les côtés du cou. L'animal a l'air de porter un baschlik à coins rejetés en arrière. La nuque et le dessus du cou sont, comme la gorge et les pattes, d'une teinte brune assez foncée. La queue porte des poils très longs réunis au bout en pinceau.

" La tête est courte, le museau tronqué, les oreilles très petites, arrondies et larges, les pieds pentadactyles, à courtes griffes très acérées. Les pieds antérieurs sont semi-digitigrades, les postérieurs plantigrades."

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[1] *L. c.* p. 17.

[2] Ann. & Mag. Nat. Hist. (1883) p. 370, where see the woodcuts of skull and dentition.

[3] See Cat. Cuvier, B. Mus. p. 91; also P. Z. S. 1864, p. 69, pl. 10; and P. Z. S. 1865, p. 114.

[4] See d'Orbigny, Amer. Merid.; also P. Gervais, Mus. ii. p. 115; A. Doering, Zoologia, Buenos Ayres, 1881; O. Thomas, Ann. & Mag. Nat. Hist. (1883) p. 370; and Carl Vogt, Mammifères (1884), p. 244.

Gulo[1].—This Bear-like musteline form consists of but one species, which ranges over the extreme north of both continents—Siberia, Russia, Scandinavia, Canada, only to the extreme north of the United States towards the Atlantic but down possibly to Northern California in the Western region. It has very small ears, inconspicuous, and hairy on both sides, very small eyes, a naked muzzle with groove and very hairy palmar and plantar surfaces with small pads amongst the hairs. A short tail, about the length of the head, clothed with long hairs; the feet are large and the habit semiplantigrade.

Its ferocity appears to have been exaggerated, and Audubon and Bachman speak of having seen one which was so gentle that the owner of the show, in which it was confined, took it out and opened its mouth "to enable us," they say, "to examine its teeth, and it buried its head in our lap while we admired its long claws and felt its woolly feet." It had been taught to sit on its haunches and hold a pipe in its mouth. It was adverse to the light of the sun, and seemed attached to a Marmot in the same cage. The same authors say that it feeds principally on the carcases of beasts killed by accident, and destroys disabled quadrupeds, eating also Marmots, Mice, and other rodents. They deem the assertion that it attacks large healthy game incredible. But it is after all a formidable beast, and bold dogs would not enter its burrow a second time. Richardson saw one chasing a Hare which was being, at the same time, harassed by a Snowy Owl. The Glutton, however, was much too slow in its movements to catch it. Captain Ross says that in midwinter it climbed the snow-wall round his vessel and came on deck, where, undismayed by the presence of a dozen men, it seized a canister of meat, which it ate so ravenously that it allowed itself to be snared by a noose and strangled.

There are 14 or 15 dorsal, 5 lumbar, 3 sacral, and 15 or 16 caudal vertebræ. The metacarpus is at its maximum relative length amongst Arctoids, and indeed amongst Carnivores if we except Cynoid and *Hyænidæ*. The inner condyle of the humerus is perforated[2].

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[1] *Gulo*, Gesner, Quad. Vivip. (1551) p. 623; Aldrovandus, Quad. Dig. (1645) p. 178.
Mustela gulo, Linn. S. N. i. (ed. 10, 1758) p. 45, no. 3; Erxl. Sys. Ann. (1777) p. 477, no. 15.
Ursus gulo, Schreber, Säug. iii. (1778) p. 525, pl. 144, 144*a*.
Meles gulo, Pallas, Spic. Zool. xiv. (1782) p. 25, pl. 2.
Gulo borealis, Wagn. Supp. ii. (1841) p. 246; Gray, P. Z. S. 1865, p. 120; Cat. Carniv. B. Mus. 98.
Gulo arcticus, Desm. Mamm. i. (1820) p. 174; Less. Mamm. p. 142; Fischer, Syn. p. 154.
Gulo luscus, Richardson, F. B. A. I. 1829, p. 41; Fisch. Syn. p. 154; Audubon & Bachman, Quad. N. A. I. p. 202, pl. 26; Baird, N. A. Mamm. p. 181; Sabine, 'Supp. Parry's 1st Voyage,' p. 184; Coues, Fur-bear. An. p. 34; P. Gervais, Mamm. ii. p. 108; Buffon, H. Nat. xiii. p. 278, & Supp. iii. 240, pl. 48; De Blainville, Ostéog. *Mustela.*

[2] Owen, Anat. of Vertebrates, vol. ii. p. 509.

The cranial characters have been, in the main, given by Prof. Flower[1]. Besides these it may be noted that the outline of the skull seen in profile has a rather striking resemblance to that of some of the larger Cats. The muzzle is very broad, more so relatively than in any Arctoid yet noted except *Conepatus* and *Ailurus*.

It is prolonged backwards behind the last molars, though hardly more so than in *Mellivora*, and it has not so definite a lateral boundary as in the latter, though the pterygoids show a tendency to descend below the general level of the palate[2]. The maxilla forms but a small floor to the orbit. The zygomata extend much outwards, owing to the breadth of the glenoid surfaces. The sagittal ridge is much as in *Mellivora*. The glenoid foramen is very large.

A slight ridge connects the paroccipital and mastoid processes, and the latter, though conspicuous, does not depend below the meatus auditorius externus. The stylo-mastoid foramen is very conspicuous. The infra-orbital foramen is moderate or rather small. The angle of the mandible is little conspicuous and is pressed upwards, though not so much so as in *Arctonyx* and *Mydaus*.

Molar formula$=$P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The dentition considerably resembles that of *Mellivora*, as to the form of teeth, not of course as to their number.

The outermost upper incisor, however, is very large and canine-like. The fourth upper premolar is relatively larger than in *Mellivora*—especially its hindmost cusp; the first upper molar is a little more equal in length externally and internally than is generally the case in the last-mentioned genus. The fourth lower premolar has only one hinder cusp and that smaller—thus resembling *Galictis*. The first lower true molar is larger than in *Mellivora*. There is a very small heel and no inner tubercle. There is a second true molar, which is a small, rounded tooth. The dentition is very sectorial, at once more sectorial and powerful than in any other Arctoid. It may therefore be interesting to compare its dentition with that of one or two other specially predacious carnivora.

Gulo *compared with* Felis—has the incisors relatively larger. The third upper premolar is rather smaller with the main cusp less relatively produced, the fourth upper premolar, or upper sectorial, has its fore-cusp smaller, its hind cusp large and more equal in development to the mid-cusp, and the internal cusp larger. The first true molar is also much larger.

In the lower jaw the third premolar is less trilobed than in *Felis* and its principal lobe is less developed. The sectorial, or first true molar, differs by having a large heel, and in having the two principal cusps less lofty. There is a second true molar.

Gulo *compared with* Hyæna *and* Felis.—The incisors are not so large relatively as in *Hyæna*, and the other ones are less preponderating. In these respects *Gulo* is more like *Hyæna* than *Felis*. The third upper premolar is much smaller relatively. The hind cusp is less marked and little produced. The fourth premolar has its fore cusp *much* smaller, the Hyæna's being larger relatively than in *Felis*. The relative proportions of the mid and hind cusps in *Gulo* are much as in *Hyæna*. The internal cusp is not so big relatively as it is in *Hyæna*, though it is more like that of *Hyæna* than that of *Felis*. The first molar is a little larger than in *Hyæna*, which is intermediate between *Gulo* and *Felis* as regards the development of this tooth.

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[1] P. Z. S. 1869, p. 12.

[2] See above, p. 373.

In the lower jaw the fourth premolar is less trilobed and the principal lobe is less developed. The sectorial has a large heel. There is a second true molar.

Gulo *compared with* Cryptoprocta, Hyæna, *and* Felis.—In the upper jaw the third premolar of *Cryptoprocta* is intermediate in form between that of *Felis* and that of *Gulo*, but is more like that of the former. The same is the case as regards the upper sectorial, both as regards the three external cusps and the inner cusp. The first upper molar of *Cryptoprocta* is also intermediate in its development, but is much more Cat-like than Glutton-like. In the lower jaw the canine of *Cryptoprocta* is more like that of *Felis* than is the case with the canine of *Hyæna*. The fourth premolar has a less trilobed crown in *Gulo* than in *Cryptoprocta*. The sectorial has a small heel, but not like that of *Gulo*, and the last genus alone of the three has a second true molar.

Gulo *compared with* Canis.—In the upper jaw the third premolar is smaller, and has a smaller posterior cusp. The sectorial is very like that of *Canis*, but the hindmost cusp is rather thicker transversely. *Gulo* has a much smaller first true molar and no second one.

In the lower jaw, the fourth premolar is less trilobed, or rather less quadricuspidate, this tooth of the Dog being much like that of the Hyæna. The sectorial of *Gulo* has a smaller heel and the mid cusp predominates less over the fore cusp. The second true molar is much smaller and there is no third molar.

The brain [1] shows an elongated Ursine lozenge. The cerebrum is very wide posteriorly and its dorsal surface is much complicated, the anterior limb of the sagittal gyrus being greatly expanded and convoluted, while posteriorly it is medianly grooved.

Lutra [2].—The Otters, of which there are at least nine, possibly a dozen species (of very uniform coloration), are found over all the geographical regions except the Australian. No species, however, appears to be common to the Old and New Worlds. It is therefore the most cosmopolitan genus of Arctoids we have yet met with. The external characters of the genus are familiar, but it may be noted that the muzzle has no central groove or only a trace of it at the lower margin of the nasal pad. The ears are small, rounded, and simple. The palmar and plantar surfaces may be naked or more or less hairy, according to the species.

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[1] See *l. c.* p. 17.

[2] Erxleben, Syst. n. 448; Schreb. Säug. iii. p. 457, pl. 126 *a*; Desm. Mamm. p. 188; Bell, Brit. Quad. p. 129; Buffon, Hist. Nat. vii. p. 134, pl. 11–17; Wagner's Supp. ii. p. 249; P. Gervais, Mamm. ii. p. 116; Gray, P. Z. S. 1865, p. 126; Cat. Carnivora B. Mus. p 100; De Blainville, Ostéog. *Mustela*; Linn. S. N. i. p. 66 (*Mustela lutra*); Pallas, Zoogr. i. p. 76 (*Viverra lutra*). Under this genus are also included Gray's genera *Barangia*, *Lontra*, *Nutria*, *Latronectes*, *Hydrogale*, *Latax*, *Pteronura*. See Cat. Carnivora of Brit. Mus. pp. 100–113.

The tail may have (as in the exceptional form *L. sendbachii*[1]) a prominent ridge along either side of the tail, and the feet may approximate in form to those of *Enhydra*.

There are 14 or 15 dorsal, 6 or 5 lumbar, 3 sacral, and from 20 to 26 caudal vertebræ. Both the humerus and radius are at their minimum of relative length in the whole of the Carnivora, as also is the relative breadth of the skull behind the orbits.

The skull is so long that, though the palate is broad, its length compared with its breadth is greater than in any other Arctoid; and the excess of the length of the pelvic limb over the pectoral is only exceeded by that of *Enhydra* amongst the whole of the Carnivora.

The hyperapophyses on the cervical vertebræ are longer than in any form yet noticed. The are twelve quasi chevron bones to the tail. Each consists of a pair of diverging hypapophyses, which tend, irregularly, to send out mesiad processes below. Each pair depends from the preaxial end of its centrum, beginning at the fourth caudal vertebra.

The scapula develops a very strong metacromion process, while the acromion is very slender. The preaxial margin of the scapula is exceedingly convex. The humerus may or may not have a supracondyloid canal. The supinator ridge is very strongly marked. The ulna develops a distinct process from the middle of its shaft, which process abuts against the radius. The ultimate phalanges of the manus are exceedingly short. The femur has a very strong external trochanteric ridge extending down its shaft. The ultimate phalanges of the pes are of about the same length as those of the manus.

To the cranial characters given by Prof. Flower[2] may be added the following:—The skull is much flattened superiorly. The ascending process of the premaxilla does not, so far as I have seen, reach the frontal. The maxilla develops a rudimentary preorbital process[3]. Venous channels traverse the exoccipital, and open on the inner side of either occipital condyle[4]. The meatus auditorius externus is relatively small. The foramen condyloideum is conspicuous. The mastoid process is concave beneath, and does not descend below the meatus auditorius externus. No ridge connects it with the paroccipital process. The palate is not greatly prolonged behind the last molars. The pterygoids descend below the level of the palate. The internasal septum does not extend back to the hinder margin of the palate. The zygomata, though slender, are rather strongly arched outwards. There are both malar and frontal postorbital processes, though the latter may be very slightly marked or strongly so. The skull is extremely pinched in behind the orbits. There is a large sagittal and very large lambdoidal ridge. The skull is extremely broadened out behind, but the muzzle is very short. The postglenoid process is much developed, and tends to hold the mandible as in the Badger. The basioccipital is very thin, and defect of ossification may exist in it and in the exoccipitals. The rhinencephalic fossa is also shallower than heretofore[1]. The crista galli is large. The turbinals are very large and complex. The infraorbital foramen is enormously large. The angle of the mandible is much as in *Meles* but rather strongly everted, the ascending ramus being very concave externally.

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[1] This is the type of Gray's genus *Pteronura*. See P. Z. S. 1865, p. 131, 1868, p. 66, and Wiegmann's Archiv, iv. p. 392 (1839).

[2] See P. Z. S. 1869, p. 11.

[3] A rudiment of that which is found amongst the Pinnipedia.

[4] Another approximation to the characters of the Pinnipedia.

Molar formula$=$P. $\frac{4}{3}$, M. $\frac{1}{2}$.

The middle incisor of each ramus of the mandible is placed behind the other two. The upper sectorial and molar are much like those of *Helictis*[2], save that the antero-internal cusp of the former is smaller. The lower molar teeth are also much like those of *Helictis*, except that the second true molar is a little larger relatively.

In the upper jaw the first premolar is minute; the second and third, each simple and conical, but greatly increasing in size, and with an external cingulum; the fourth has three external cusps, of which the median one greatly predominates, and an external cingulum. There is a very large internal cingulum embracing the postero-internal part of the tooth, which is two thirds the length of the external part. The upper molar has two external cusps and a small external cingulum, with one internal principal cusp, and a large internal cingulum, which may develop another internal cusp.

In the lower jaw all the grinders have an external cingulum. The three premolars are pretty simple and conical, successively increasing in size backwards. The sectorial has two external and one internal principal cusps, with a large talon developing small accessory cusps. The second molar is small and rounded.

The tongue has the papillæ which clothe it pretty uniform in size, except that the flattened papillæ are elongated and rather conspicuous. There are five circumvallate papillæ forming a V, open forwards.

Of the salivary glands the parotid is thin, and the submaxillary is larger than the parotid; it is, indeed, large and bilobed.

The larynx has the thyroid cartilage rather sharply notched, medianly below.

The lungs have the form usual in the Carnivora.

The diaphragmatic aspect of the liver is very like that presented by *Nasua*, as also is that of its abdominal aspect, save that the Spigelian lobe is subdivided and the caudate large, and especially longer.

The kidney differs greatly from that of all Arctoids yet described, and from that of all non-Arctoid Carnivores. Instead of being single, with one mamilla, it is lobulated, each of the many lobes being a little kidney in itself, with one mamilla.

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[1] Other Pinniped characters.

[2] See *anteà*, p. 374.

The brain[1] is, of course, wide behind, as is the skull which holds it; its dorsal surface is very complicated, but exhibits a rather faintly marked Ursine lozenge placed rather far back. The anterior limb of the Sylvian gyrus is very much narrower than its posterior limb. The Sylvian fissure is very long and extremely oblique. The crucial and calloso-marginal sulci appear to join.

As similarity of habit often produces, or coexists with, similarity of structure, thus giving rise to independent resemblances which are no sign of genetic affinity, it may be interesting to compare the structure of the Arctoid aquatic Carnivore, *Lutra*, with that of the Æluroid aquatic Carnivore, *Cynogale*. In this instance similarity of habit has gone very little way in evolving similarity of structure, for, in addition to the divergences as to the form of the *basis cranii* and as to other points which differentiate the Æluroids and Arctoids, the two former exhibit the following divergences:—

The Æluroid Otter, *Cynogale*.	The Arctoid Otter, *Lutra*.
Neck more than a fourth the length of spine from atlas to end of sacrum.	Hardly more than a fifth.
Tail little more than half such length of spine.	More than eight tenths.
Humerus and radius together more than one third such length.	Hardly more than one quarter.
Pectoral limb to spine at 100 =55·5.	= 39·5.
Pelvic limb =68·4.	= 50·9.
Cranial length =29·5.	= 18·8.
Relative length of palate =16·0.	= 8·5.
Interorbital breadth =4·1.	= 1·9.
Therefore skull much pinched in behind orbits.	Extremely so.
Muzzle very long.	Muzzle very short.
Zygomata very strong.	Rather slender.
Cranium not very broad posteriorly.	Very broad posteriorly.
Lambdoidal ridge very large.	Moderate.
Rather large infraorbital foramen.	Infraorbital foramen very large indeed.
Nasals long and narrow.	Nasals short and broad.
Premaxillæ slender.	Premaxillæ very broad.
Cribriform plate rather narrow.	Cribriform plate rather broad.
Scapula quadrate.	Anterior margin very convex.
Humerus rounded anteriorly.	Produced into a sharp eye anteriorly.
Inner condyle moderate, and not perforated.	Inner condyle very large and perforated.
An intercondyloid perforation.	No intercondyloid perforation.
Radius with no median process to join ulna.	Radius with a median process to join ulna.
Femur considerably larger than humerus.	Very slightly so.
Tibia of about the same length as the femur.	Tibia decidedly larger than femora.
Anterior molars much elongated.	Not so.
First upper premolar large.	Very small.
First inferior true molar not sectorial.	Sectorial.
Second inferior true molar two thirds the length of the first.	Not half the length of the first.

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[1] See *l. c.* p. 20.

Aonyx[1].—This small genus of the species from Nepal, Java, Sumatra, and South Africa, differs from *Lutra* in its rudimentary or even obsolete claws, and in having the feet only slightly webbed. The palmar and plantar surfaces are quite naked, or at most have but a few scattered hairs.

There are 14 dorsal, 6 lumbar, 3 sacral, and 20 caudal vertebræ. The ultimate phalanges of the manus and pes are much shorter relatively than in any other Arctoid. The breadth of the brain-case, compared with the length of the skull, is at its maximum amongst Arctoids, as is the length of the first lower true molar.

Caudal vertebræ with hypapophyses depending from the hinder end of the centrum of the first and of the second vertebræ and from the front end of the centrum of the third vertebra and of the succeeding vertebræ to the tenth. Three real chevron bones are placed beneath the intervals of the vertebræ, between the third and the sixth.

The humerus has a condyloid canal. The radius develops no process from the ulna. The acromion is very slender. No special ectotrochanteric ridge to femur. Ultimate phalanges exceedingly minute; those of pes slightly lower than those of manus.

The skull resembles that of *Lutra*, save that it is less flattened, especially the bullæ. The cranial ridges are generally smaller, as are the mastoid and paroccipital processes. The pterygoids tend less to depend. There are no defects of ossification in the exoccipitals.

Molar formula = P. $\frac{4 \text{ or } 3}{3}$, M. $\frac{1}{2}$.

The true molars are more massive than in *Lutra*. The first upper molar is large relatively and more preponderating over the fourth premolar.

Enhydra[2].—This very peculiar genus, containing only a single species, is confined to the coasts and islands of the North Pacific, descending south, on the American side, as far as Lower California. The ears are very small and very low down, but little above the line of the mouth. The whiskers are few, short, and stout. The muzzle is naked at the end, and has a vertical groove traversing part of it. The fore feet are wonderfully small, with very short digits, short, curved claws, and naked palms. The hind feet are very long, with very long digits webbed to their tips, and with hairy soles, and short, stout, curved claws. The tail is stout.

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[1] Lesson, Mamm. p. 157; Fischer, Synop. p. 228; P. Gervais, Mamm. ii. p. 118; Gray, P. Z. S. 1865, p. 129; id. Cat. Carniv. B. Mus. p. 109; Horsfield, Zool. Research, vii.; Raffles, Linn. Trans. xiii. p. 254; De Blainville, Ostéogr. *Mustela.*

[2] *Mustela lutris*, Linn. Syst. Nat. i. (1758) p. 45, no. 1; Schreber, Säug. iii. (1777) p. 128; Gmelin, Syst. Nat. i. (1788) no. 1.
Mustela, De Blainville, Ostéographie.
Phoca lutris, Pallas, Zoog. Rosso-As. i. (1831) p. 100, no. 34.
Lutra lutris, Gray, P. Z. S. 1865, p. 136, pl. vii. and Cat. Carniv. B. Mus. p. 118.
Lutra marina, Steller, Nov. Ann. Petrop. ii. (1751) p. 367, tab. xvi.; Erxleben, Syst. Nat. (1777) p. 445; Schreber, Säug. iii. (1778) p. 465, pl. cxxviii.; Desm. Mamm. i. (1820) p. 189; Harlan, Faun. Amer. (1825) p. 72.
Lutra stelleri, Lesson, Mamm. (1827) p. 156, no. 423.
Enhydra marina, Fleming, Philos. Zool. ii. p. 187; Martin, P. Z. S. (1836) p. 59; Aud. & Bachman, N. A. Quad. iii. p. 170, pl. cxxxvii.; Baird, M. North Am. (1857) p. 189.
Enhydris marina, Licht. Darstell. Säug. (1827) p. 34, pls. 49 and 50; Wagner's Supp. ii. p. 268; P. Gervais, Mamm. ii. p. 119.
Enhydris stelleri, Fischer, Syn. (1829) p. 229.
Enhydris lutris, Coues, Fur-bear. Anim. p. 326.
Lutra (*Enhydra*) *marina*, Richardson, F. B. Am. i. (1829) p. 59, no. 21; id. Zool. Beechey's V. (1839) p. 5.

There are 14 dorsal, 6 lumbar, 4 sacral, and 21 caudal vertebræ.

As to the proportions of the skeleton, the cervical region is at its minimum length (compared with the spine) amongst Arctoids save *Cercoleptes*, also the length of the palate is at its minimum, as is the breadth of the skull behind the orbits. The length of the first upper molar, compared with that of the skull, is at its maximum amongst all Carnivores, as is also its breadth and to a yet greater degree. The length of the pelvic limb over that of the pectoral limb is greatly in excess of that found in any other Carnivore.

The cervical vertebræ have moderate hypapophyses. The thorax is very capacious. The caudal region is short and without chevron bones. The acromion is short. The humerus has a condyloid canal. The femur is very short. The digits of the feet are very unlike those of any other Arctoid. Those of the manus are indeed short and nearly equal in length; but those of the pes are very elongated, and are flattened like those of Seals. The fifth is the longest. The length of the metatarsals of the individual measured, and the other dimensions of which are given in the tables annexed, are as follows:—Of the first, 8″ 8‴; of the second, 11″ 5‴; of the third, 13″ 2‴; of the fourth, 14″ 4‴; and of the fifth, 15″. The fifth is the stoutest as well as the longest.

As to the cranial characters, in addition to those given by Professor Flower[1] it may be noted as follows:—The maxilla forms a very large floor to the orbit, and there are venous canals, inside the exoccipitals, which open inside the condyles. There are, occasionally, defects of ossification in the exoccipitals. The occiput inclines forwards and upwards. The basis cranii is very much broadened out and flattened. The postorbital processes are less marked than in *Lutra* and *Aonyx*. The nasal aperture is extremely large, and there is hardly any rhinencephalic depression, the wide, large cribriform plate lying flush with the general inner wall of the skull. The angle of the mandible is much as in *Meles*. The subangular margin is everted, but not so much so as in *Lutra*.

Dental formula $=$ I. $\frac{3}{2}$, C. $\frac{1}{1}$, P. $\frac{3}{3}$, M. $\frac{1}{2}$.

It differs from every other Carnivore except the extinct *Eusmilus*[2]

Sea Otter, Penn. Syst. Quad. (1771) p. 241; Cook's Third Voyage (1784) ii. p. 295, pl. 43.

Saricorienne, Buffon, Supp. vi. p. 287.

[1] P. Z. S. 1869, p. 11.

[2] See 'The Cat,' p. 438, fig. 190.

in having only four lower incisors. The molars all have their tubercles curiously rounded. The fourth upper premolar has the antero-posterior length of its inner and outer sides more equal than heretofore, and has two central subequal cusps and two inner ones, whereof the anterior is very much indeed the larger. There is also an internal cingulum. The first upper true molar is shaped like that of *Taxidea*, only that it has a less predominantly broadened villus, and that all its tubercles are rounded ; it has a small external, and an exceedingly large internal, cingulum. It has also two external cusps, whereof the anterior is the larger, and three internal ones.

The lower molars are similar to those of *Lutra*, only they are more broadened out and flattened and have more rounded tubercles. The first lower true molar has a small anterior cusp, then two large ones, one external and one internal, followed by a large talon. The second true molar is broader than long.

In the milk-dentition the first upper deciduous molar is a very small, conical tooth. The second is more sectorial than is the third premolar, having no postero-internal tubercle or any internal cingulum. It has one anterior cusp, with a pair of cusps (one internal and the other external) behind it. The third deciduous molar is very like the fourth premolar, but it has a relatively bigger internal cingulum and a large postero-internal tubercle, and thus it so far approximates towards the form of the first upper true molar. The third deciduous inferior molar is more Otter-like than is the fourth lower premolar, but it has a larger (especially broader and above all posteriorly broader) talon, which forms rather more than half of the entire tooth. The three outer cusps, however, are blunter than in *Lutra*, though they are not so blunt as are the permanent molars of the adult animal.

The brain[1] differs from that of *Lutra* in having the crucial sulcus placed more forwards, and the Ursine lozenge larger and more conspicuous.

Ursus[2].—This well-known genus of about ten species ranges from the Arctic region southwards. For the main part confined to the Palæarctic and Nearctic regions, it descends to Africa north of the Sahara, to Ceylon and the Indian Archipelago, and to Peru and Chili. The genus is, however, entirely unrepresented in the Australian and Ethiopian region, and has only one species (*U.*

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[1] P. Z. S. 1869, p. 20.

[2] See Albertus Magnus, de Anim. lib. xxii. p. 183 ; Linn. S. N. 169 ; Pallas, Zoogr. Ross.-Asiat. i. p. 64 ; Gmelin, S. N. i. p. 100 ; Fischer, Syn. Mam. p. 143 ; Horsfield, Linn. Trans. xv. p. 332 ; Temm. Fauna Japonica ; Desm. Mamm. p. 165 ; Richardson, F. B. Amer. i. p. 14 ; Raffles, Linn. Trans. xiii. p. 254 ; Schreber, Säug. p. 513 ; De Blainville, Ostéog. *Ursus* ; Cuvier, Oss Fossiles, iv. ; P. Gervais, Mamm. ii. p. 10 ; Wagner, Supp. ii. p. 130 ; Buffon, Hist. Nat. viii. p. 248, pl. 31–33, xv. p. 128, Supp. iii. p. 200, pl. 34 ; Baird, Mam. N. Am. ; Gray, P. Z. S. 1864, p. 680 ; Cat. Carniv. Brit. Mus. p. 215 ; Sclater, P. Z. S. 1862, p. 361, pl. 32 ; 1864, p. 374, 1867, p. 817 ; Swinhoe, P. Z. S. 1863, p. 380 ; Hempr. & Ehrenb. Symb. Physicæ, i. t. i. ; Radde, Mélanges Biologiques de St. Pétersb. iii. p. 677. The above genus *Ursus* includes the *Thalassarctos*, *Myrmarctos*, and *Helarctos* of Gray.

ornatus) in the Neotropical. No one species is common to the Old and New Worlds, with the exception of the White Bear (*U. maritimus*).

The palmar and plantar surfaces are naked save in *U. maritimus*. The ears are erect, rounded, and of moderate size. The eyes are small; the nose may or may not have a median vertical groove, according to the species.

There are 14 dorsal, 6 lumbar, 6 sacral, and from 8 to 10 caudal vertebræ. The number of the sacral vertebræ being thus double that of most other Arctoids, the relative length of the sacral region is at its relative as well as absolute maximum, and indeed at its maximum amongst all Carnivora, while the tail is at its relative Arctoid minimum. The length of the limbs relatively is also at the maximum amongst Arctoids after *Procyon*. The femur is also at its relative maximum amongst all Carnivora. The length of the fourth upper premolar and the breadth of the first true molar are also at their minimum compared with the length of the spine. The scapula has an elongated posterior angle, the femur is relatively slender as well as elongated. The inner condyle of the humerus is not perforated save in *Ursus ornatus*[1].

The more significant cranial characters of *Ursus* have been excellently described and figured by Professor Flower[2]. In the skulls I have examined I have found the premaxillæ and frontals touch, excluding the nasals from the maxillæ. The maxilla forms but an exceedingly small floor to the orbit, but it develops a rudimentary preorbital process.

The lateral margins of the basioccipital are each produced into an antero-posteriorly elongated descending process. The paroccipital and mastoid processes are connected by a slight ridge. The mastoid process descends below the meatus auditorius externus. The sagittal and lambdoidal ridges are moderate. The infraorbital foramen is small. The zygomata are well arched out and develop a malar postorbital process. There are marked postorbital processes to the frontals. The mandible is like that of *Ailurus*, the coronoid process not ascending much. The angle is long and slender, and extends backwards. There is a distinct subangular process.

Molar formula = P. $\frac{4}{4}$, M. $\frac{2}{3}$.

P. $\frac{1+2+3}{1+2+3}$ are small, one-rooted, and deciduous, P. $\frac{2}{2+3}$ are especially deciduous.

Ursus differs from all other Arctoids except *Ailuropus* in having a third inferior true molar.

The grinding teeth are, as it were, those of *Procyon* developed through those of *Ailurus* in the *direction* of those of *Ailuropus*, but their modification is not carried so far as it is in the last-named genus. The fourth upper premolar (the sectorial) has only two external cusps and an internal cingulum, there being no internal cusp.

The first upper molar has four cusps, whereof the two outer are much the stronger.

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[1] Owen's Anat. of Vertebrates, vol. ii. p. 508.

[2] P. Z. S. 1869, p. 7.

There is a very faintly marked external cingulum and a very strong internal one. The second true molar has four cusps. Of these the two outer are the stronger pair, while the inner pair are more prolonged antero-posteriorly. There is a trace of an external cingulum. The internal cingulum is strongly developed. There is an elongated talon supporting irregular prominences somewhat like those found in *Ailuropus.*

The fourth lower premolar has one cusp, to which a small keel is annexed. The first molar is quinquecuspidate—one anterior, then two principal cusps (one within and the other without), followed by two cusps, side by side, on the heel. The second molar has four cusps (a pair external and a pair internal opposite each other), with one transverse ridge in front of the anterior pair, and another behind the posterior pair. The third lower molar is a rounded tooth, the crown of which has an irregular punctional surface very like that found on the molars of *Ailuropus.*

The thyroid cartilage is very strongly notched below medianly.

The tongue has a well-developed lytta [1], and is covered with small conical papillæ, amongst which larger fungiform papillæ are scattered. There are five circumvallate papillæ, forming a V-shaped patch as usual. The papillæ are larger in front of this patch. Behind it are flattened papillæ which have the form of large conical cones. The kidney is lobulated, each lobe being a small kidney in itself with one mamilla.

The brain [2] is richly convoluted. The Sylvian fissure is exceedingly long and exceedingly oblique. The sagittal gyrus is especially complicated, expanding greatly in front, and tends to be divided into two longitudinally. The parietal gyrus is simple and single. The Sylvian gyrus has its anterior limb exceedingly slender. The Ursine lozenge here attains its maximum of size and distinctness. The calloso-marginal and crucial sulci are separated by a continuation of the hippocampal gyrus forwards and upwards into the sagittal gyrus behind the crucial sulcus.

Melursus [3]. — This curious Indian species has an elongated snout which resembles that of *Mydaus.* It is naked, and has no median groove whatever. It has very extensile lips, and very elongated and curved blunt claws.

There are 15 dorsal, 5 lumbar, 5 sacral, and 11 caudal vertebræ.

The relative length of the skull is at its maximum amongst Carnivores. The postorbital processes of the frontal are smaller than in *Ursus*. The palate is very broad, and much more prolonged behind the molars than in *Ursus*[1]. The zygomata are short and extend straight backwards and outwards without being arched outwards. Instead of lateral processes to the basioccipital there are processes of the temporal bones.

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[1] Cuvier, Leçons d'Anat. Comp. tome iv. 1^{re} partie, p. 553.

[2] See *l. c.* p. 19, fig. 8.

[3] *Ursus labiatus,* Desm. Mam. p. 166; Foster, Syn. Mam. p. 144; Hodgson, J. A. S. B. i. p. 340, x. p. 910; P. Z. S. 1834, p. 9; Calcutta Journ. N.H. iv. p. 288; Wagner, Supp. ii. p. 148; P. Gervais, Mam. ii. p. 18.
Ursus longirostris, Tiedemann, Abh. über das vermeintl. bärenart. Faulthier, 1820; Reichenbach, N. A. Nat. Cur. xiii. i. p. 323, pl. xv.
Bradypus ursinus, Shaw, Zool. i. p. 159, pl. xlvii.
Prochilus ursinus, Illiger, Prod. p. 109.
Melursus labiatus, Meyer, Gray, P. Z. S. 1864, p. 699; Cat. Carniv. Brit. Mus. p. 237.
Ursus labiatus, De Blainville, Ostéog.

The teeth are relatively very small, and the first upper incisor is absent or soon falls away.

In the milk-dentition, the second and third molars both above and below are very small and simple. The fourth upper one has two outer cusps and a large internal cusp, with a minute cusp in front of the first of the two outer ones. It is much more sectorial than is the fourth premolar, which replaces it. The fourth lower molar has three outer cusps; the most anterior is very small, the next very high, and the third rather small. There is a fourth minute cusp inside the middle outer cusp and a fifth inside the third outer cusp, and slightly smaller than is the third cusp.

The tongue has a large lytta. Large fungiform papillæ are scattered all over the tongue's surface. The flattened papillæ are rather small and inconspicuous. The circumvallate papillæ are remarkable: there are two series of very conspicuous and very close-set papillæ, which together form a very obtuse angle.

The liver is very like that of *Nasua* or *Procyon*, only the right central lobe is rather smaller compared with the right lateral lobe, and the left central is very small.

The kidney is described in the Catalogue of the Royal College of Surgeons as having two mamillæ to each of its lobes.

The brain has the same characters as has the brain of *Ursus*.

CLASSIFICATION OF THE ARCTOIDEA.

With good reason has Professor Flower remarked upon the difficulty of subdividing the great Arctoid group in a satisfactory manner. The characters most available for this purpose are the dental characters; but these are eminently adaptive ones, and would, taken alone, serve but to mislead the inquirer, as we have seen with *Proteles* and *Hyæna*, *Arctictis*, *Cynogale*, and *Cryptoprocta*, amongst the Æluroids.

The Bears form a small and very natural section, characterized not only by their peculiar dentition, but also by their complex kidneys and completely plantigrade feet.

Similarly the Otters, with their conglomerate kidneys and peculiar cranial structure, also form a small, well-marked group.

The Badger, with its caudal pouch and exceptional dentition, presents another type round which a few genera may be grouped, while the Raccoon and Coati form another section, to which *Bassaris* and *Bassaricyon* may be added, while *Cercoleptes* can, I think, find no other allies better suited for its adhesion than are these. The same I believe to be the case with *Ailurus*, but *Ailuropus* presents us with a doubtful problem. It has the number of true molar teeth and the external form of the Bears, but it is less plantigrade. The condyloid foramina are minute instead of very large, and the basioccipital has the depressions separated by a crest, as in the Badgers, instead of being flat and wide, as in the Bears; and the bulla, instead of being wide and flattened, is slightly swollen out, but very small, as in *Ailurus*. Then there is no alisphenoid canal; while the glenoid foramen, so conspicuous in the Bears, is hidden at the bottom of a large notch between the bulla and the zygoma. The general form of the mandible also is much more like that of *Ailurus* than of *Ursus*. There is a fundamental resemblance also between the crowns of the teeth in *Ailurus* and *Ailuropus*, in spite of their exaggerated character in the latter genus; so that on the whole it appears to me that there is a more decided natural affinity between *Ailuropus* and *Ailurus* than between *Ailuropus* and *Ursus*.

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[1] The palate in *Ursus* may be very little prolonged beyond the last molar, as in *U. ornatus*, no. 815 in the Museum of the Royal College of Surgeons.

The Weasels and their allies seem to be specially predacious variations of the Badger type; and I have no reason to urge (beyond the structure of the kidney) against the generally received view that the Otters are aquatic variations of the same type.

There will thus be three families, PROCYONIDÆ, MUSTELIDÆ, and URSIDÆ. The first of these is plainly subdivisible into two subfamilies—(1) *Procyoninæ*, and (2) *Ailurinæ*; while I agree with Professor Flower in dividing the MUSTELIDÆ into the three subfamilies—(1) *Melinæ*, (2) *Mustelinæ*, and (3) *Lutrinæ*.

These subdivisions may be synoptically characterized as follows:—

Fam. I. PROCYONIDÆ.

Kidneys simple. True molars $\frac{2}{2}$ or $\frac{2}{3}$, obtusely tuberculated. Dentition not sectorial. Alisphenoid canal present or absent.

Hab. America or Asia.

Subfamily 1. PROCYONINÆ.

True molars $\frac{2}{2}$. No alisphenoid canal. Molars not very complexly tuberculated.

Hab. America.

Procyon. *Bassaris.* *Cercoleptes.*
Nasua. *Bassaricyon.*

Subfamily 2. AILURINÆ.

True molars $\frac{2}{2}$ with an alisphenoid canal, or $\frac{2}{3}$ without an alisphenoid canal. Molars very complexly tuberculate.

Hab. Eastern Asia.

Ailurus. *Ailuropus.*

Fam. II. MUSTELIDÆ.

Kidneys mostly simple. True molars $\frac{1}{2}$ or $\frac{1}{1}$. Teeth tuberculate or sectorial. No alisphenoid canal.

Hab. Old and New Worlds.

Subfamily 1. MELINÆ.

Kidneys simple. Feet elongated. Toes straight. Claws non-retractile, blunt, those of manus generally elongated. Dentition sectorial or not so. Habits mostly terrestrial and fossorial.

Meles.
Arctonyx.
Taxidea.
Mydaus.
Mephitis.
Conepatus.
Mellivora.
Helictis.
Ictonyx.

Subfamily 2. MUSTELINÆ.

Kidneys simple. Feet short, partially webbed. Claws short, curved, often semi-retractile. Dentition sectorial. $\frac{\text{M. 1}}{}$ wide transversely. Habits terrestrial or arboreal.

Galictis.
Grisonia.
Mustela.
Putorius.
Gulo.

Subfamily 3. LUTRINÆ.

Kidneys conglomerate. Feet short and rounded (except hind feet of *Enhydra*). Toes webbed. Claws small, curved, blunt. Head broad. Molars large and quadrate. $\frac{\text{M. 1}}{}$ long as well as wide. Habits aquatic.

Lutra.
Aonyx.
Enhydra.

Fam. III. URSIDÆ.

Kidneys conglomerate. True molars $\frac{2}{3}$, longer than broad. Dentition not sectorial. An alisphenoid canal. Feet completely plantigrade.

Ursus.
Melursus.

GENERIC CHARACTERS.

PROCYONINÆ.

- $\frac{\text{P. 4}}{}$ sectorial .... *Bassaris.*
- $\frac{\text{P. 4}}{}$ not sectorial
  - Tail prehensile .... *Cercoleptes.*
  - Tail not prehensile ....
    - A proboscis .... *Nasua.*
    - No proboscis
      - Postorbital processes elongated. Body long ...... *Bassaricyon.*
      - Postorbital processes short. Body short ...... *Procyon.*

AILURINÆ.

M. $\frac{2}{2}$ .... *Ailurus.*
M. $\frac{2}{3}$ .... *Ailuropus.*

MELINÆ.

- $\underline{\text{M. 1}}$ quadrate or very long as well as broad ....
  - Pig-like snout........................
    - $\underline{\text{M. 1}}$ very greatly exceeding $\underline{\text{P. 4}}$ in size .... *Arctonyx.*
    - Not very greatly... *Mydaus.*
  - No pig-like snout ...
    - Claws of manus enormous .... *Taxidea.*
    - Claws of manus not enormous ..
      - P. $\frac{2}{2}$ .... *Mephitis.* (Palate to last molar.)
      - P. $\frac{3}{3}$ .... *Conepatus.* (Palate produced beyond last molar.)
      - P. $\frac{4}{4}$ .... *Meles.* $\underline{\text{M. 1}}$ enormous.
- $\underline{\text{M. 1}}$ much broader than long ...
  - P. $\frac{4}{4}$ .... *Helictis.*
  - P. $\frac{3}{3}$ ....
    - M. $\frac{1}{1}$ .... *Mellivora.*
    - M. $\frac{1}{2}$ .... *Ictonyx.*

MUSTELINÆ.

- Feet plantigrade ....
  - Tail long. Nose with median groove ...... *Galictis.*
  - Tail short. No median groove to nose ...... *Grisonia.*
- Feet digitigrade ....
  - P. $\frac{4}{4}$; M. $\frac{1}{2}$ .... *Mustela.*
  - P. $\frac{3}{3}$; M. $\frac{1}{2}$ .... *Putorius.*
  - P. $\frac{2}{2}$; M. $\frac{1}{1}$ or $\frac{1}{2}$ .... *Pœcilogale.* (Bulla flattened.)
  - P. $\frac{2}{2}$; M. $\frac{1}{1}$ .... *Lyncodon.* (Bulla very convex.)
- Feet large, plantigrade. P. $\frac{4}{4}$; M. $\frac{1}{2}$ .... *Gulo.*

LUTRINÆ.

- I. $\frac{3}{3}$. Third phalanges not extremely short .... *Lutra.*
- I. $\frac{3}{3}$. Third phalanges extremely short .... *Aonyx.*
- I. $\frac{3}{2}$ .... *Enhydra.*

URSIDÆ.

- Snout and claws not very much elongated .... *Ursus.*
- Snout and claws very much elongated .... *Melursus.*

Comparison of the ARCTOIDEA *with the other* FISSIPEDAL CARNIVORA.

It would be superfluous to here again refer to the cranial or genital characters which differentiate the three suborders of the Carnivora. As to the dentition, the Arctoids alone of the existing forms present us in one genus with but four lower incisors, a condition also characteristic of the extinct Æluroid *Eusmilus*. They alone afford examples of upper true molars, which are broad and formed for crushing, and only in them do we find a fourth lower premolar, which is broad posteriorly. The dentition may nevertheless be extremely sectorial or more formed for crushing than in any other Carnivore; but the teeth are never so rudimentary as in *Proteles*. Only in them (*Grisonia*) do we find as many as sixteen dorsal vertebræ. They possess a brain which has a definite character in the almost constant presence of a dorsal patch limited incompletely by crucial and precrucial grooves, which have been called the "Ursine lozenge." While perineal glands are absent, we occasionally find a new glandular structure—a subcaudal gland, as in *Meles* and *Taxidea*.

Less exclusively terrestrial than the Cynoids, they are never so arboreal as are some of the Æluroids; but they present us with more fossorial genera, and with others perhaps more definitely modified for aquatic life than is the Æluroid *Cynogale*.

As to the coloration of this group, the Arctoids have frequently longitudinal markings, often of black and white, while they never show the spots or transverse bands which are found in many Æluroids.

All the Arctoidea are pentadactyle. There is a great difference between the Arctoidea and the other Carnivora as regards the vertical median nose-groove. Very rarely absent in the Æluroids, it is, as we have seen, absent in a good many genera of Arctoids, and sometimes, as in *Ursus*, present or absent in different species of the same genus. Only in the Arctoids, but almost always in them, the crucial and precrucial sulci define an "Ursine lozenge" on the surface of the cerebrum.

Distribution of the ARCTOIDEA.

This suborder extends all over the world except Australia, New Zealand, New Guinea and adjacent islands, Polynesia, Madagascar, the Antilles, and the Antarctic region.

The *Procyonidæ* are exclusively New-World forms, the *Ailuridæ* are exclusively Asiatic. The *Mustelidæ* and *Ursidæ* are cosmopolitan within the range of the suborder. The majority of the species and genera belong north of the equator.

No genera except *Ursus*, *Gulo*, *Mustela*, *Putorius*, and *Lutra* are common to the Old and New Worlds, and no species are common to them save *Gulo luscus*, *Putorius vulgaris*, *Putorius erminea*, and *Ursus maritimus*. The genera common to Asia and Africa are *Mustela*, *Putorius*, *Lutra*, *Ursus*, *Mellivora*, and *Aonyx*. The genera peculiar to Africa are *Ictonyx* and *Pœcilogale*. The genera peculiar to Asia are *Ailurus*, *Ailuropus*, *Helictis*, *Arctonyx*, *Mydaus*, and *Melursus*. The genera peculiar to America are *Procyon, Nasua, Cercoleptes, Bassaris, Bassaricyon, Taxidea, Mephitis, Conepatus, Galictis, Grisonia, Lyncodon*, and *Enhydra*. The genera peculiar to the Old World are those already enumerated as peculiar to Asia and to Africa respectively, with the addition of *Mellivora, Aonyx*, and *Meles*. There are thus eleven exclusively Old-World and twelve exclusively New-World genera. The Ethiopian and Neotropical regions are poor in Arctoids, as is also the Indian Archipelago.

TABLE I.

	Number of dorsal vertebræ.	Number of lumbar vertebræ.	Number of sacral vertebræ.	Number of caudal vertebræ.	Length of cervical vertebræ.	Length of dorsal vertebræ.	Length of lumbar vertebræ.	Length of sacrum.	Length of caudal vertebræ.	Length from front of atlas to hinder end of sacrum.
Canis dingo	13	7	3	19	″16·5	″29·0	″13·5	″3·8	″32·3	″62·8
Procyon	14	6	3	16–20	6·2	15·3	10·5	4·5	28·5	36·5
Nasua	14	6	3	19–23	6·5	15·5	10·0	3·5	33·0	35·5
Cercoleptes	14	6	3	26	5·0	14·5	12·9	4·4	42·5	36·8
Ailurus	14	6	3	18	8·2	18·6	12·2	4·0	45·5	43·0
Bassaris	13	7	3	23?	5·6	10·5	8·0	2·1	?	26·2
Meles	15[14]	5	3	18	8·7	25·8	10·8	3·7	19·2	49·0
Arctonyx	16	4	4	15–20	12·5	30·0	11·0	6·0	27·5	59·5
Taxidea	15	5	3	14?	7·6	21·7	9·2	3·8	19·6	42·3
Mydaus	14[15]	6 [5]	3	12	4·2	11·1	6·8	2·0	9·0?	24·1
Mephitis...........	16	6	2	21	5·0	12·5	6·5	1·7	21·4	25·7
Conepatus	16	4	3	18	4·7	13·8	5·5	2·5	20·7	26·5
Mellivora	14	4 or 5	4 or 3	15 or 16	11·0	23·4	8·8	4·8	19·3	48·0
Helictis	14	6	3	18	4·7	11·0	6·8	1·8	17·8	24·3
Ictonyx	15	5	2	23	3·6	9·7	4·4	0·8	20·3	18·5
Galictis	14	6	3	23	9·2	19·8	11·1	3·7	37·5	42·8
Grisonia...........	16	5	3	21	6·8	17·0	7·0	2·0	17·5	32·8
Mustela	14	6	3	18–23	5·8	12·8	9·0	2·0	?	29·6
Putorius...........	15–13	5–6	3	16	2·7	5·0	3·8	0·8	4·4	12·3
Gulo	14–15	5	3	15	12·0	27·6	13·0	4·1	25·5	56·7
Lutra	14–15	6 [5]	3	20–26	12·5	28·1	16·1	3·8	49·5	60·5
Aonyx	14	6	3	20	5·8	15·2	9·3	3·3	29·0	33·6
Enhydra	14	6	4	21	8·5	29·8	17·0	6·7	33·6	62·0
Ursus horribilis...	14	6	6	9	26·5	46·5	27·0	17·0	17·5	117·0
Melursus	15	5	5	11	17·0	36·0	16·5	10·5	20·8	80·0

TABLE II.

	Length of pectoral limb (humerus, radius, and manus).	Length of pelvic limb (femur, tibia, and pes).	Length of humerus (head to capitellum).	Length of radius (head to root of styloid process).	Length of femur (head to condyloid surface).	Length of tibia to root of malleolus.	Length of 3rd metacarpal.	Length of 3rd metatarsal.	Length of ultimate phalanx of 3rd digit of manus.	Length of ultimate phalanx of 3rd digit of pes.
Canis	″43·0	″49·3	″15·0	″15·5	″17·0	″16·8	″5·8	″6·7	″1·6	″1·5
Procyon	27·2	33·5	10·0	10·5	11·8	12·4	2·8	3·9	1·0	1·0
Nasua	22·5	29·0	9·0	8·2	10·8	10·3	2·3	3·0	1·5	1·3
Cercoleptes	20·2	24·1	8·1	6·4	8·9	8·2	1·9	2·5	1·0	1·0
Ailurus	29·7	33·5	12·0	9·0	12·0	11·5	3·35	3·7	1·1	1·1
Bassaris	14·7	17·5	5·9	4·6	6·6	6·3	0·7	1·9	1·7	0·6
Meles	26·1	30·5	9·7	8·7	11·5	9·7	2·8	3·3	1·8	1·2
Arctonyx	29·5	32·5	11·0	9·0	12·7	10·5	3·3	3·5	2·1	1·4
Taxidea	27·1	27·1	9·7	7·9	10·0	8·2	2·7	3·1	3·2	1·6
Mydaus	16·6	16·4	8·1	4·2	6·1	6·0	1·6	1·5	1·55	0·6
Mephitis	14·0	17·1	5·5	4·3	6·1	6·0	1·4	1·8	1·0	0·7
Conepatus	17·0	20·8	6·8	5·5	8·0	7·4	1·7	1·9	1·4	0·9
Mellivora	31·9	32·8	11·8	9·7	13·2	10·8	3·0	3·1	2·9	1·3
Helictis	12·6	15·6	4·8	4·0	5·7	5·4	1·2	1·8	0·8	0·6
Ictonyx	10·7	12·8	4·0	3·2	4·4	4·4	1·2	1·7	1·0	0·8
Galictis	24·3	28·3	9·5	7·4	10·4	9·2	2·1	3·0	1·2	1·3
Grisonia	13·9	16·4	5·5	3·8	6·0	5·4	1·7	2·2	0·8	0·6
Mustela	16·0	20·4	6·0	4·7	6·5	6·9	2·0	2·8	0·4	0·5
Putorius	4·9	5·8	2·0	1·5	2·0	2·0	0·45	1·0	......	......
Gulo	37·0	43·0	13·0	11·6	14·5	13·6	4·7	5·7	1·8	1·5
Lutra	23·9	30·8	9·6	6·3	10·0	10·5	3·1	4·5	0·9	0·8
Aonyx	18·0	20·7	6·3	5·3	6·7	7·0	2·3	3·0	0·2	0·3
Enhydra	23·2	38·0	10·0	7·4	10·2	11·3	2·3	6·2	0·7	1·0
Ursus horribilis	81·5	92·0	32·5	27·0	40·0	27·0	7·5	7·7	6·0	4·0
Melursus	54·0	58·0	21·5	18·5	25·5	19·5	4·5	4·5	4·5	2·9

[Manus of *Ursus horribilis*... 22·0]
[Pes of *Ursus horribilis* ...... 25·0]
[Manus of *Melursus* .... 14·0]
[Pes of *Melursus* .... 13·0]

Table III.

	Basion to front of premaxilla.	Length of palate.	Greatest breadth of palate.	Palatine foramina in front or hinder half of palate.	Greatest width of zygomata.	Greatest breadth of brain-case.	Breadth of narrowest part behind post-orbital processes.	Length from front of lower canine to hinder surface of hindmost lower molar.
Canis	15·9″	8·7″	4·4″	hinder	9·8″	5·4″	3·5″	8·45″
Procyon	10·3	8·8	2·4	hinder	7·4	4·7	2·5	5·0
Nasua	11·0	7·6	2·3	hinder	6·6	4·3	3·3	5·2
Cercoleptes	7·7	3·8	1·6	hinder	5·8	3·7	1·6	2·7
Ailurus	9·7	5·5	2·5	hinder	8·1	4·3	2·5	5·5
Ailuropus	23·5	12·4	4·0	hinder	21·0	8·0	3·5	14·2
Bassaris	7·1	3·4	1·4	hinder	5·0	3·4	1·8	3·4
Meles	12·2	7·0	2·0	near middle	8·6	5·0	2·2	5·2
Arctonyx	15·4	11·2	2·4	near middle	9·2	4·7	3·3	6·4
Taxidea	12·2	6·7	2·1	hinder	7·7	5·0	2·9	5·1
Mydaus	7·1	4·2	1·5	front ½	4·2	3·1	2·0	2·7
Mephitis	6·3	2·6	1·3	front ½	4·4	2·6	1·8	2·7
Conepatus	6·6	2·9	1·5	front ½	4·8	3·4	2·1	2·9
Mellivora	12·0	5·7	2·5	front or middle	8·0	5·6	2·6	4·6
Helictis	6·4	3·3	1·1	hinder or middle	4·2	3·0	1·8	2·7
Ictonyx	5·2	2·6	1·0	middle	3·7	2·8	1·4	2·3
Galictis	10·4	5·6	1·9	middle	6·8	4·4	2·1	4·0
Grisonia	7·1	3·8	1·7	front or middle	4·4	3·4	1·7	2·6
Mustela	4·3	1·8	0·8	hinder	2·5	1·9	1·1	1·55
Putorius	3·2	1·3	0·5	hinder	1·7	1·5	0·8	1·2
Gulo	13·2	7·4	3·0	hinder	9·6	5·7	4·0	6·0
Lutra	11·4	5·2	1·7	front ½	7·7	4·9	1·2	4·4
Aonyx	8·0	3·8	1·3	front	5·8	4·5	1·6	3·5
Enhydra	11·0	5·2	1·7	front	7·7	4·9	1·2	4·4
Ursus arctos	28·0	15·5	4·3	hinder	19·5	9·5	7·0	13·2
—— horribilis	30·0	17·0	4·8	hinder	20·5	9·8	7·2	14·4
—— americanus	21·6	11·9	3·5	hinder	13·6	7·7	5·9	10·0
—— thibetanus	28·0	15·0	4·0	hinder	19·0	10·5	7·3	12·0
—— malayanus	20·5	10·8	4·0	hinder	16·0	9·1	6·6	8·8
—— ornatus	15·5	8·0	3·0	hinder	10·2	7·4	4·6	7·8
—— maritimus	30·5	16·2	5·0	hinder	19·0	9·9	6·2	12·8
Melursus	24·5	13·7	5·1	hinder	16·2	8·5	6·1	10·3

TABLE IV.

	Antero-posterior extent of $\underline{\text{P. 4.}}$	Antero-posterior extent of $\underline{\text{M. 1.}}$	Transverse extent of $\underline{\text{M. 1.}}$	Antero-posterior extent of $\underline{\text{M. 2.}}$	Vertical extent of $\underline{\text{P. 4.}}$	Vertical extent of $\overline{\text{M. 1.}}$	Antero-posterior extent of $\overline{\text{M. 1.}}$	Antero-posterior extent of $\overline{\text{M. 2.}}$	Antero-posterior extent of $\overline{\text{M. 3.}}$
Canis	″1·65	″1·1	″1·5	″·5	″1·2	″1·3	″2·0	″·8	″·4
Procyon	·8	·9	·9	·6	·65	·65	1·1	1·0	...
Nasua..............	·70	·75	·8	·65	·5	·5	·8	·8	...
Cercoleptes	·5	·48	·49	·4	·3	·2	·50	·49	...
Ailurus	·7	·85	1·1	·5	·55	·65	1·12	1·10	...
Ailuropus	2·6	2·7	2·7	3·7	...	...	3·2	2·5	2·0
Bassaris	·7	·6	·7	·3	·5	·5	·8	·55	...
Bassaricyon	·4	·55	·50	·3	...	...	·52	·50	...
Meles	1·5	...	...	...	·5	·5	1·7	·6	...
Arctonyx	1·6	...	...	...	·4	·4	1·8	·75	...
Taxidea	1·3	1·1	1·0	...	·7	·7	1·5	·5	...
Mydaus	·5	...	...	...	·4	·4	·8	·4	...
Mephitis............	·60	·65	·65	...	·4	·4	·9	·3	...
Conepatus	·7	·83	·85	...	·6	·5	1·0	·4	...
Mellivora	1·3	·6	1·1	...	1·0	·8	1·3	...	...
Helictis	·7	·4	·6	...	·4	·25	·7	·20	...
Ictonyx	·7	·4	·6	...	·4	·35	·7	·25	...
Galictis	·7	·3	·7	...	...	...	·7	·25	...
Grisonia............	·7	·3	·6	...	·4	·4	·8	·2	...
Mustela	·5	·15	·4	...	·3	·3	·45	·1	...
Putorius............	·3	·13	·3	...	...	...	·3	·09	...
Gulo	2·0	·7	1·3	...	1·15	1·10	2·1	·5	...
Lutra	1·0	·8	1·0	...	·6	·6	1·3	·5	...
Aonyx...............	1·0	·7	1·0	...	·55	·50	1·2	·4	...
Enhydra	1·1	1·3	1·8	...	·7	·6	1·5	·6	...
Ursus arctos	1·3	2·0	1·5	3·3	1·0	·9	2·0	2·3	1·9
—— horribilis ..	1·6	2·0	1·5	3·7	·9	·8	2·2	2·4	1·9
—— americanus	1·1	1·7	1·3	2·5	·9	·8	1·7	1·7	1·2
—— thibetanus...	1·1	1·9	1·4	3·0	·8	·9	2·0	2·0	1·6
—— malayanus...	1·2	1·5	1·3	1·9	·8	·9	1·7	1·7	1·2
—— ornatus	1·1	1·5	1·2	2·1	·8	·9	1·7	1·7	1·2
—— maritimus...	1·4	1·8	1·3	2·4	1·2	1·2	2·0	1·9	1·3
Melursus	1·1	1·7	1·0	1·7	?	?	1·6	1·4	·8

Table V.

Proportional parts of Skeleton, the spinal column from front of atlas to end of sacrum being taken as 100, length of:—

	Cervical region.	Dorsal region.	Lumbar region.	Sacrum.	Tail.	Pectoral limb.	Pelvic limb.	Humerus	Radius.	Femur.	Tibia.	3rd meta-carpal.	3rd meta-tarsal.	3rd phalanx of 3rd digit of manus.	3rd phalanx of 3rd digit of pes.
Canis	26·2	46·1	21·4	6·0	51·4	68·4	78·5	23·8	24·6	27·0	26·7	9·2	10·6	2·5	2·3
Procyon	16·9	41·9	28·7	12·3	78·0	74·5	91·7	27·4	28·7	32·3	33·9	7·6	10·6	2·7	2·7
Nasua............	18·3	43·6	28·1	9·8	92·9	63·3	81·6	25·6	23·1	30·4	29·0	6·4	8·4	4·2	3·6
Cercoleptes	13·5	39·4	35·0	11·9	115·4	54·8	65·4	22·0	17·3	24·1	22·2	5·1	6·7	2·7	2·7
Ailurus	19·0	43·2	28·3	9·3	105·8	69·0	77·9	27·9	20·9	27·9	26·7	7·7	8·6	2·5	2·5
Ailuropus	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Bassaris............	21·3	40·0	30·5	8·0	?	56·1	66·7	22·1	17·9	25·1	24·0	6·4	7·2	2·6	2·2
Bassaricyon	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Meles	17·7	52·6	22·0	7·5	39·1	53·2	62·2	19·7	17·7	23·4	19·7	5·7	6·7	3·6	2·4
Arctonyx	21·0	50·4	18·4	10·0	46·2	49·5	54·6	18·4	15·1	21·3	17·6	5·5	5·8	3·5	2·3
Taxidea	17·9	51·4	21·7	8·9	46·3	64·0	64·0	22·9	18·6	23·6	19·3	6·3	7·3	7·5	3·7
Mydaus	17·4	46·1	28·2	8·2	?	68·8	68·0	33·6	17·4	25·3	24·8	6·6	6·2	6·4	2·4
Mephitis............	19·4	48·6	25·2	6·6	83·2	54·4	66·5	21·4	16·7	23·7	23·3	5·4	7·0	6·6	2·7
Conepatus	17·7	52·0	20·7	9·4	78·1	64·1	78·4	25·6	20·7	30·1	27·9	6·4	7·1	5·2	3·3
Mellivora	22·9	48·7	18·3	9·9	40·2	66·4	68·3	24·5	20·2	27·5	22·5	6·2	6·4	6·0	2·7
Helictis	19·3	45·2	27·9	7·4	73·2	51·8	64·1	19·7	16·4	23·4	22·2	4·9	7·4	3·2	2·4
Ictonyx	19·4	52·4	23·7	4·3	109·7	57·8	69·1	21·6	17·2	23·7	23·7	6·4	9·1	5·4	4·3
Galictis	21·4	42·2	25·9	8·6	80·8	56·7	66·1	22·1	17·2	24·2	21·4	4·9	7·0	2·8	3·0
Grisonia............	20·7	51·8	21·3	6·0	53·3	42·3	50·0	16·7	11·5	18·2	16·4	5·1	6·7	2·4	1·8
Mustela	19·5	43·2	30·4	6·7	?	54·0	68·9	20·2	15·8	21·9	23·3	6·7	9·4	1·3	1·6
Putorius............	21·9	40·6	30·8	6·5	35·7	34·0	47·1	16·2	12·1	16·2	16·2	3·6	8·1	......	......
Gulo	21·1	48·6	22·9	7·2	44·9	65·2	75·8	22·9	20·4	25·5	24·1	8·2	9·3	3·1	2·6
Lutra	20·6	46·4	26·6	6·2	81·8	39·5	50·9	15·8	10·4	16·5	17·3	5·1	7·4	1·4	1·3
Aonyx	17·2	45·2	27·6	9·8	86·3	53·5	61·6	18·7	15·7	19·9	20·8	6·8	8·9	0·5	0·8
Enhydra	13·7	48·0	27·4	10·8	54·1	37·4	61·2	16·1	11·9	16·4	18·2	3·7	10·0	1·1	1·6
Ursus horribilis...	22·6	39·7	23·0	14·5	14·9	69·6	78·6	27·7	23·0	34·1	23·0	6·4	6·5	5·0	3·4
Melursus	21·2	45·0	20·6	13·1	26·0	67·5	72·5	16·8	23·1	31·8	24·3	5·6	5·6	5·6	3·6

TABLE VI.

Proportional parts of Skeleton, the spinal column from front of atlas to end of sacrum being taken as 100, length of:—

	Basion to pro-maxilla.	Length of palate.	Breadth of palate.	Breadth of zygomata.	Breadth of brain-case.	Breadth behind orbits.	Length from front of lower canine to hinder surface of hindmost lower molar.	Length of $\underline{\text{P. 4.}}$	Length of $\underline{\text{M. 1.}}$	Breadth of $\underline{\text{M. 1.}}$	Length of $\overline{\text{M. 1.}}$	Length of $\overline{\text{M. 2.}}$
Canis	25·3	13·8	7·0	15·6	8·6	5·5	13·4	2·6	1·7	9·4	3·1	1·2
Procyon	28·2	24·1	6·5	20·2	12·8	6·8	13·9	2·1	2·4	2·4	3·0	2·7
Nasua	30·9	21·1	6·4	18·5	12·1	9·2	14·6	1·9	2·1	2·2	2·2	2·2
Cercoleptes	20·9	10·3	4·3	15·7	10·0	4·3	7·2	1·35	1·30	1·33	1·35	1·33
Ailurus	22·5	12·7	5·8	18·8	10·0	5·8	12·7	1·6	1·9	2·5	2·6	2·5
Bassaris	27·1	12·9	5·3	19·0	12·9	6·8	12·9	2·6	2·2	2·6	3·0	2·1
Meles	24·8	14·2	4·0	17·5	10·2	4·4	10·6	3·0	......	......	3·4	1·2
Arctonyx	25·8	18·8	4·0	15·4	7·9	5·5	10·7	2·6	......	......	3·0	1·2
Taxidea	28·8	15·8	4·9	18·2	11·8	6·8	12·0	3·0	2·6	2·3	3·5	1·1
Mydaus	29·4	17·4	6·2	17·4	12·8	8·2	11·2	2·0	......	......	3·3	1·6
Mephitis	24·5	10·1	5·0	17·1	10·1	7·0	10·5	2·3	2·5	2·5	3·5	1·3
Conepatus	24·9	10·9	5·6	18·1	13·2	7·9	10·9	2·6	3·1	3·2	3·7	1·5
Mellivora	23·3	11·9	5·2	16·6	11·6	5·4	9·5	2·7	1·2	2·2	2·7	......
Helictis	26·3	13·5	4·5	17·2	12·3	7·4	11·1	2·8	1·6	2·4	2·8	......
Ictonyx	28·1	14·0	5·4	20·0	15·1	7·6	12·9	3·7	2·1	3·2	3·7	1·3
Galictis	24·2	13·0	4·4	15·8	10·2	4·8	9·3	1·6	·7	1·6	1·6	·5
Grisonia	21·6	11·5	5·1	13·4	10·3	5·1	7·9	2·1	·9	2·1	2·4	·6
Mustela	14·5	6·0	2·7	8·4	6·4	3·7	5·2	1·6	·5	1·3	1·5	·3
Putorius	26·0	10·5	4·0	13·8	10·6	6·5	9·7	2·4	1·0	2·4	2·4	·7
Gulo	23·2	13·0	5·2	16·9	10·0	7·0	10·5	3·5	1·2	2·2	3·7	·8
Lutra	18·8	8·5	2·8	12·7	8·0	1·9	7·2	1·6	1·3	1·6	2·1	·8
Aonyx	23·8	11·3	3·8	17·2	13·3	4·7	10·4	2·9	2·0	2·9	3·5	1·1
Enhydra	17·7	8·3	2·7	12·4	7·9	1·9	7·0	1·7	2·0	2·9	2·4	·9
Ursus horribilis	25·6	14·5	4·1	17·5	8·3	6·1	12·3	1·3	1·7	1·2	1·8	2·0
Melursus	36·2	17·1	6·3	22·4	10·6	7·6	12·8	1·3	2·1	1·2	2·0	1·7

Table VII.

Proportions of Skull and Teeth, the length from basion to front of premaxilla being taken as 100.

	Length of palate.	Breadth of palate.	Breadth of zygomata.	Breadth of brain-case.	Breadth behind orbits.	Length of $\underline{\text{P. 4.}}$	Length of $\underline{\text{M. 1.}}$	Breath of $\underline{\text{M. 1.}}$	Length of $\underline{\text{M. 2.}}$	Length of $\overline{\text{M. 1.}}$	Length of $\overline{\text{M. 2.}}$	Length of $\overline{\text{M. 3.}}$
Canis	54·7	27·6	61·6	34·9	22·0	10·3	6·9	......	3·1	12·5	5·0	2·5
Procyon	85·4	23·3	71·8	45·6	24·2	7·7	8·7	8·7	5·8	10·6	9·7	......
Nasua	69·0	20·9	60·0	39·0	30·0	6·3	6·8	7·2	5·9	7·2	7·2	......
Cercoleptes	49·3	20·7	75·3	48·0	20·7	6·4	6·2	6·3	5·1	6·4	6·3	......
Ailurus	56·7	25·7	83·5	44·3	25·7	7·2	8·7	11·3	5·1	11·5	11·3	......
Ailuropus	52·7	17·0	89·3	34·0	14·8	11·0	11·4	11·4	15·7	13·1	10·6	8·5
Bassaris	47·9	19·8	70·4	47·9	25·3	9·9	8·4	9·9	4·2	11·2	7·7	......
Meles	57·5	16·3	70·4	40·9	18·0	12·2	......	......	......	13·9	4·9	......
Arctonyx	72·7	15·5	59·7	30·5	21·4	10·3	......	......	......	11·6	4·8	......
Taxidea	54·9	17·2	63·1	40·9	23·7	10·6	9·0	8·1	......	12·2	4·0	......
Mydaus	59·2	21·1	59·2	43·6	28·1	7·0	......	......	......	11·2	5·6	......
Mephitis	41·2	20·6	69·8	41·2	28·5	9·5	10·3	10·3	......	14·2	4·7	......
Conepatus	43·9	22·7	72·7	53·0	31·8	10·6	12·5	12·8	......	15·1	6·0	......
Mellivora	47·5	20·8	66·6	46·6	20·8	10·8	5·0	9·1	......	10·8	......	......
Helictis	51·5	17·1	65·6	46·8	28·1	10·9	6·2	9·3	......	10·9	3·0	......
Ictonyx	50·0	19·2	71·1	53·8	26·9	13·4	7·6	11·5	......	13·4	4·8	......
Galictis	53·8	18·2	65·3	43·2	21·9	6·5	2·9	6·5	......	6·5	2·4	......
Grisonia	53·5	23·9	62·0	47·9	23·9	9·9	4·2	8·4	......	11·2	2·8	......
Mustela	41·8	18·6	58·1	44·1	25·5	11·6	3·4	9·3	......	10·4	2·3	......
Putorius	40·6	15·6	53·1	46·8	25·0	9·3	4·0	9·3	......	9·3	2·8	......
Gulo	56·0	22·7	72·7	43·2	30·3	15·1	5·3	9·8	......	15·9	3·7	......
Lutra	45·6	14·9	67·9	42·9	10·5	8·7	7·0	8·7	......	11·4	4·4	......
Aonyx	47·5	16·2	72·5	56·2	20·0	12·5	8·7	12·5	......	15·0	5·0	......
Enhydra	47·2	15·4	70·0	44·5	10·9	10·0	11·8	16·3	......	13·6	5·4	......
Ursus arctos	55·3	15·3	69·6	33·9	25·0	4·6	7·1	5·3	......	7·1	8·2	6·7
—— horribilis	56·6	16·0	68·3	32·6	24·0	5·3	6·6	5·0	......	7·3	8·0	6·3
—— americanus	55·0	16·2	62·9	35·6	27·3	5·0	7·8	6·0	......	7·8	7·8	5·5
—— thibetanus	53·5	14·2	67·8	37·5	26·0	3·9	6·7	5·0	......	7·1	7·1	5·7
—— malayanus	52·6	19·5	78·0	44·3	32·1	5·8	7·3	6·3	......	8·2	8·2	5·8
—— ornatus	51·6	19·3	65·8	47·7	29·6	7·0	9·6	7·7	......	10·9	10·9	7·7
—— maritimus	53·1	16·3	62·2	32·4	20·3	4·5	5·9	4·2	......	6·5	6·2	4·2
Melursus	55·9	20·8	66·1	34·6	24·8	4·4	6·9	4·0	......	6·5	5·7	3·2

Proportion borne by the pelvic limb (femur, tibia, and pes) to the pectoral limb taken as 100.

Canis dingo	114·6	Mellivora	102·8
Procyon	123·1	Helictis	123·7
Nasua	128·8	Ictonyx	119·6
Cercoleptes	119·3	Galictis	116·4
Ailurus	112·7	Grisonia	117·9
Bassaris	119·0	Mustela	127·5
Bassaricyon	—	Putorius	118·3
Meles	116·8	Gulo	116·2
Arctonyx	110·1	Lutra	128·8
Taxidea	100·0	Aonyx	115·0
Mydaus	100·0	Enhydra	163·7
Mephitis	122·1	Ursus horribilis	112·8
Conepatus	122·3	Melursus	107·4

4. Report on the Collection of Birds made during the Voyage of the Yacht 'Marchesa.' Part II. Borneo and the Island of Cagayan Sulu. By F. H. H. GUILLEMARD, M.A., M.D., F.L.S., &c.

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(Plate XXV.)

Section I. BORNEO.

The cruise of the 'Marchesa' in Borneo was confined to the Sarawak district and the territory of the North Borneo Company. Certain islands to the northward were also visited, the most interesting of which was Cagayan Sulu, a solitary volcanic island in the Sulu Sea, from which no specimens have hitherto been brought. Examples of altogether one hundred and fourteen species were obtained from the mainland of Borneo. All these have, with one exception, been previously recorded from that country, and as the chief interest in the collection lies in the fact of some of the localities being new, a list only of the species is here given.

SPILORNIS PALLIDUS, Walden.

Spilornis bacha, Salvadori, Uccelli di Borneo, p. 7.

Silam, Darvel Bay, N.E. Borneo.

MICROHIERAX LATIFRONS, Sharpe.

Silam, Darvel Bay.

LORICULUS GALGULUS, Linn.

Loriculus galgulus, Salvad. *op. cit.* p. 26.

Three specimens from Silam.